CHAPTER 4—ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

The purpose of this chapter is to determine the potential for significant impact of the "Federal action" on the "human environment." The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act of 1969 (NEPA) states that the "human environment" shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment (40 Code of Federal Regulations [CFR] §1508.14). The "Federal action" is the Bureau of Land Management's (BLM) selection of a Master Leasing Plan (MLP) and possible land use plan amendments on which future land use actions will be based.

This chapter objectively evaluates the potential environmental impacts of implementing each management alternative described in Chapter 2. This chapter forms the analytic basis for the comparative summary of impacts presented in Chapter 2. Chapter 3 describes the existing conditions of the resources and resource uses that would be affected by the management alternatives. The organization of this chapter parallels that of Chapter 3, in that the resource programs are presented in the same order. Because resources and resource uses are often interrelated, one section may refer to another.

4.2 ANALYSIS METHODS

The BLM manages public lands for multiple uses in accordance with the Federal Land Policy and Management Act of 1976 (FLPMA). The FLPMA requires the BLM to manage public lands and resources according to the principles of multiple use and sustained yield, including recognizing the nation's needs for domestic sources of minerals, food, timber, and fiber. To ensure that the BLM meets its mandate of multiple use in land management actions, the impacts of the alternatives on resources and resource uses are identified and assessed as part of the planning process.

The analysis of the alternatives is focused on identifying the types of impacts anticipated to occur and estimating their potential intensity. The analysis is organized by resource program and discloses the potential impacts on each resource program from implementing each of the proposed alternatives. The impact analysis for Alternative A (No Action) was prepared first to serve as the baseline for alternative comparison. It is important to note that management decisions for each resource or resource use directly or indirectly relate to each other; therefore, impacts on one particular resource program may also apply to other programs. It is therefore recommended that the reader review all impact analyses to attain a comprehensive description of the impacts on the resource or resource use in question.

Potential impacts of certain land use activities can be compared visually among the alternatives by using geographic information system (GIS) data. The locations of resources and management thereof are shown on Maps 2-1 through 2-68. The geographic implications associated with each management alternative are presented in Tables 2-17 through 2-20 in Chapter 2. These maps and tables should be reviewed in conjunction with the impact analyses.

Acreage calculations used in this analysis are approximate values for alternative comparison and analytic purposes only and do not reflect exact measurements of on-the-ground resources and actions. These acreage values were calculated using Esri ArcGIS Desktop 9.3.1 software. The projection of GIS data that was analyzed to provide the acreage calculations is USA Contiguous Albers Equal Area Conic, based on the North American Datum of 1983 (NAD83).

4.2.1 Types of Impacts

Throughout this chapter, the terms "impact" and "effect" are used interchangeably. Impacts can be direct, indirect or cumulative. Impacts may be positive (beneficial) or negative (adverse). The analysis of impacts compares the types and intensity of impacts among the alternatives. In some cases, adverse impacts that occur to resource values or uses under a particular alternative are of a lower intensity as compared to other alternatives. In these cases, the reduction of an impact is considered a positive effect on the affected resource values or uses, as it compares to other alternatives. Table 4-1 provides an overview of the general types of impacts discussed in this chapter.

Table 4-1. Types of Impacts

Type	Description
Direct Impacts	Direct impacts occur at the same time and place as the action responsible for the impact. For example, removal of vegetative cover caused by facility construction would be considered a direct impact on vegetation resources.
Indirect Impacts	Indirect impacts are temporally and spatially removed from the action responsible for the impact, but are related to the action through a process of cause and effect. For example, removal of vegetative cover caused by facility construction that consequently results in increased surface runoff and sedimentation of nearby streams would be considered an indirect impact on water resources. Indirect impacts may reach beyond the natural and physical environment (i.e., environmental impact) to include growth-inducing effects and other effects related to induced changes to resource uses (i.e., non-environmental impact).
Cumulative Impacts	Cumulative impacts result from the incremental impact of an action when added to other past, present, and reasonably foreseeable actions, regardless of which agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions that take place over time.

4.2.2 Analysis Assumptions

Assumptions for analysis are made to assist in determining the potential environmental, social, and economic impacts of the alternatives (Chapter 2) on the affected environment (Chapter 3). They are based on expected trends (e.g., population growth or decline within the Planning Area), expected demands (e.g., increases in certain kinds of recreational use), and the likelihood of resource development (e.g., the reasonably foreseeable development (RFD) scenario for oil and gas). Assumptions are for the purpose of analysis only. They are presumed true for the purpose of equitably comparing the alternatives; do not constrain or define management; and are based on observations, historical trends and professional judgment. Assumptions are generally made for the expected life of the Moab MLP, unless otherwise stated. General assumptions applicable to all resources and resource uses are described below. Resource-specific assumptions are described under each resource program in the sections that follow.

The following general assumptions were used in the environmental effects analysis:

- The decisions proposed in the alternatives apply to public lands and areas that require Federal permitting or authorization. However, cumulative impact analyses also consider decisions made for resources managed by other entities or individuals.
- The planning criteria described in Chapter 1 apply to all alternatives.
- The alternatives will be implemented as described in Chapter 2 and associated appendices.

- Implementation actions will comply with valid existing rights and all Federal laws, regulations, and policies.

- To the extent possible, the stipulations developed for oil and gas leasing are applicable to potash leasing.

- These existing leases would be subject to the specific lease stipulations that were applied under previous land use plans. However, the resource protection measures identified in the MLP/Final Enviromental Impact Statement (FEIS) will also apply to the areas currently under lease where they do not conflict with the rights granted to the holder of the lease. The Federal Government retains certain rights when issuing an oil and gas lease or a potash lease. While the BLM may not unilaterally add a new stipulation to an existing lease that it has already issued, the BLM can subject development of existing leases to reasonable conditions, as necessary, through the application of Conditions of Approval at the time of permitting.

- Exceptions to mineral leasing stipulations are found in Appendix A. Those exceptions, which affect analytic comparisons are specifically addressed in Chapter 4.

- Reference in the document to "mineral" leasing or development applies to both oil and gas and potash. However, reference to the Three Rivers mineral withdrawal refers to locatable minerals.

- Sufficient funding and personnel will be available to implement the Moab MLP.

- The temporal extent of direct and indirect impacts to resources associated with mineral development is 10 years from the cessation of operations when reclamation is complete and impacts are fully mitigated.

- The best available data was used in the preparation of the MLP/FEIS. However, certain information is unavailable or requires site-specific information to analyze. Due to a lack of quantitative data, some impacts can be discussed only in qualitative terms. Subsequent project-level NEPA documents will provide the opportunity to collect site specific data and analyze these data in quantitative terms.

- Worst-case scenario situations are not analyzed, although it is acknowledged that these unlikely events could occur.

- A decision to defer potash leasing means that future potash leasing would not be considered until the feasibility of developing potash is established. Areas deferred from potash leasing are not analyzed in this Enviromental Impact Statement (EIS). Any potash leasing on the deferred acreage would be consistent with the Moab MLP decisions and would require further analysis in a subsequent document prepared for compliance with NEPA.

- A decision to lease for oil and gas within Potash Leasing Areas (PLA) would be deferred until the feasibility of developing potash is determined. Areas deferred from oil and gas leasing are analyzed in this EIS. Any future oil and gas leasing on the deferred acreage would be consistent with the Moab MLP decisions.

4.3 AIR QUALITY

This section presents potential impacts on air quality implementing management actions presented in Chapter 2. Existing conditions concerning air quality are described in Chapter 3 (Section 3.2).

4.3.1 Assumptions

- Emission factors recommended by the U.S. Environmental Protection Agency (EPA) are appropriate for all activities, except for those emission factors that have been provided by the Utah Department of Environmental Quality.

- Prescribed and wildland fire would continue within the Planning Area.

- Recreational growth trends within the Planning Area would continue.

- The quantitative analysis includes only emissions from oil and natural gas well development, and potash mining on BLM-administered public lands. Activities related to other resources and uses such as cultural resources, recreation, lands and realty actions, prescribed burning, vegetation management, transportation and access, visual resource management (VRM), and fish and wildlife management are assumed to be minor sources of air emissions and/or not well-defined concerning emissions factors and activity levels, and therefore were not quantified.

- Activities related to other resources and uses such as cultural resources, recreation, lands and realty actions, prescribed burning, vegetation management, transportation and access, VRM, and fish and wildlife management are assumed to be minor sources of air emissions and/or not well-defined concerning emissions factors and activity levels, and therefore were not quantified.

- Changes in air quality, either from smoke, dust, haze, or other pollutants could potentially reduce or degrade scenic quality by obscuring distant views. It should be noted, however, that the Clean Air Act sets limits on the allowable degradation of visibility within the adjacent National Parks. Arches and Canyonlands National Parks have been designated as areas requiring the highest level of visibility (Prevention of Significant Deterioration [PSD] Class I). Smoke or haze that originates within the Planning Area cannot exceed the allowable National Park Service (NPS) PSD I scenic quality standards for air pollutants.

Indicators of impacts on air quality are as follows:

- Attainment status of air quality in a given area.

- Air monitoring conducted by the BLM, National Park Service, and Utah Department of Environmental Quality.

- Number and types of wells constructed and operated in a given area.

- Amount of road traffic from construction, daily operation, inspections, and road maintenance.

4.3.2 Air Quality Modeling and Quantitative Analysis

The quantitative impacts analysis consists of a far-field dispersion modeling analysis to evaluate multiple source impacts on National Ambient Air Quality Standards (NAAQS) and Air Quality Related Values (AQRV) within the Planning Area, a review of relevant near-field modeling results and their applicability

to management decisions and controls in the Planning Area, and a quantification of greenhouse gas (GHG) emissions. Ozone was examined using the source apportionment tool of the Western Regional Air Partnership (WRAP) West-wide Jumpstart (WestJump) modeling analysis (2013) to estimate contributions of sources to modeled concentrations of ozone and is presented in the cumulative impacts section (Section 4.21.3).

Far-Field Dispersion Modeling Analysis

The CALMET/CALPUFF dispersion modeling system was used to predict maximum potential far-field direct air quality impacts (excepting ozone) at PSD Class I areas within or near the Planning Area. These include Arches and Canyonlands National Parks. Three years of meteorological data sets were used to evaluate year-to-year variability and how it impacts modeled concentrations. Detailed information on the modeling is presented in the Technical Support Document (TSD) in Appendix F.

Since the MLP is a planning document, and no specific projects are being proposed or analyzed in the Planning Area, modeling conducted for this analysis is by necessity speculative. To provide managers and the public with information relevant to future planning and management actions, a range of emissions scenarios were modeled to estimate the potential impacts of varying levels of development and control scenarios. It should be stressed that none of the emissions scenarios represent likely future development, but instead are to be used to evaluate development and control scenarios in relation to air quality and air quality-related values to help guide management decisions related to future development. This is not an air quality evaluation of specific alternatives, as not enough is reliably known about potential future projects to conduct meaningful planning-level modeling of these alternatives. The reasonably foreseeable development (RFD) from Alternative A was however used as the basis for the assumptions, since this is the maximum development scenario, which ensures a conservative emissions analysis, meaning future emissions under all alternatives are likely to be less than that used under all three scenarios. The primary purpose of this modeling is to identify if any NAAQSs or AQRVs could be adversely impacted under these emission scenarios, to identify what pollutants could cause any identified impacts, and how the scale of emissions and/or their proximity to adjoining National Parks affects any modeled adverse impacts.

The modeling emissions scenarios and associated major assumptions used in the assessment are:

"High" Emissions Scenario

- 9 drill rigs = 3 oil, 5 potash, 1 "other"
- No aggregation of wells on pads
- Total numbers of wells drilled: 232 oil, 416 potash, 133 other
- 100 percent of drilled oil wells go into production = 232
- Dust control = 50 percent
- Unpaved vs. paved road ratio: 20 miles unpaved (25 mile per hour (MPH) speed limit), 20 miles paved

"Medium" Emissions Scenario

- 9 drill rigs = 3 oil, 5 potash, 1 "other"
- No aggregation of wells on pads
- Total numbers of wells drilled: 232 oil, 416 potash, 133 other
- 60 percent of drilled oil wells go into production = 140
- Dust control = 50 percent
- Unpaved vs. paved road ratio: 10 miles unpaved (25 MPH speed limit), 30 miles paved

"Low" Emissions Scenario

- 4 drill rigs = 3 oil, no potash, 1 "other"
- Aggregated 4 wells on 1 pad
- Total numbers of wells drilled: 232 oil, zero potash, 133 other
- 60 percent of drilled oil wells go into production = 140
- Dust control = 70 percent
- Unpaved vs. paved road ratio: 5 miles unpaved (25 MPH speed limit), 35 miles paved

Emissions estimates were calculated using the Oil Template from the Emissions Inventory Toolkit developed for BLM by URS Corporation (URS 2012). Potash and other well drilling were assumed to have similar emissions characteristics as oil and gas during drilling activities. Production emissions estimates were also based on outputs from the emissions calculator; however, potash production emissions estimates were not estimated or modeled due to the extremely high level of uncertainty associated with emissions estimates for this activity. The template calculates emissions of criteria pollutants (PM_{10}, $PM_{2.5}$, NOx, SO_2), and GHGs (CO_2, CH_4, $N0_2$, CO_{2eq}) based on the level of production and number of wells drilled. Only criteria pollutants and GHGs were calculated for this analysis. Carbon monoxide (a criteria pollutant) was not included in the modeling analysis as there is very little potential for emissions of this pollutant to cause or contribute to any recognizable air quality issue. A summary of the total modeled emissions is shown in Table 4-2. These modeled emissions represent the end of the build out of each scenario - when the drill rigs are drilling the last of the wells and the maximum number of wells are in production.

Table 4-2. Total Modeled Emissions at Year 15 (tons per year per scenario)

Scenario	PM_{10}	$PM_{2.5}$	NO_2	SO_2
High	849.1	97.0	230.4	3.5
Med	350.1	45.3	127.6	1.9
Low	117.5	17.3	92.7	1.3

NAAQS Results

Modeling results show no exceedances of the NAAQS for any pollutant for any of the modeled scenarios. Maximum modeled concentrations at Arches and Canyonlands receptors are shown in Table 4-3. All modeled concentrations for all met years can be found in the TSD.

Table 4-3. Moab MLP Modeling Results – Criteria Pollutants

Location	Concentration
Nitrogen Dioxide – 1-hour Concentrations (µg/m3)	
Arches National Park	4.13
Canyonlands National Park	9.18
Nitrogen Dioxide – Annual Concentrations (µg/m3)	
Arches National Park	0.06
Canyonlands National Park	0.13
$PM_{2.5}$ – 24-hour Concentrations (µg/m3)	
Arches National Park	0.30

Location	Concentration
Canyonlands National Park	0.84
$PM_{2.5}$ – Annual Concentrations (µg/m3)	
Arches National Park	0.06
Canyonlands National Park	0.11
PM_{10} – 24-hour Concentrations (µg/m3)	
Arches National Park	2.65
Canyonlands National Park	7.50
SO_2 – 1-hour Concentrations (µg/m3)	
Arches National Park	0.10
Canyonlands National Park	0.11
SO_2 – 3-hour Concentrations (µg/m3)	
Arches National Park	0.03
Canyonlands National Park	0.06

Deposition Results

All modeled values of sulfur and nitrogen deposition were near or below the Deposition Analysis Thresholds (DAT) of 0.005 kg/ha/yr for total nitrogen and total sulfur for all the modeled alternatives, with the exception of the high and medium emissions scenarios for nitrogen deposition in Arches and Canyonlands National Park for the 2008 meteorological year. Results are presented for each Class 1 Area in Table 4-4.

Table 4-4. Arches and Canyonlands National Park Deposition

	Nitrogen deposition (kg/ha/yr)			**Sulfur deposition** (kg/ha/yr)		
Arches National Park – Deposition						
Met Data Year	**high**	**med**	**low**	**high**	**med**	**low**
2006	0.00466	0.00260	0.00197	0.000215	0.0001199	0.0000825
2007	0.00457	0.00254	0.00199	0.000206	0.0001151	0.0000834
2008	0.01074	0.006075	0.00483	0.000349	0.0001985	0.0001420
Canyonlands National Park – Deposition						
Met Data Year	**high**	**med**	**low**	**high**	**med**	**low**
2006	0.00578	0.00306	0.00223	0.000231	0.000121	0.0000804
2007	0.00551	0.00291	0.00222	0.000222	0.000116	0.0000778
2008	0.01795	0.01019	0.00857	0.000544	0.000311	0.000235

Visibility Results

Visibility impacts from potential 24-hour primary PM_{10}, secondary sulfate and nitrate particulate matter, and elemental carbon concentrations were calculated within mandatory Federal Class I areas (Arches and Canyonlands National Parks). Calculated concentrations were compared to "natural" background conditions as recommended in the Federal Land Managers Air Quality Related Values Group (FLAG) Guideline document (U.S. Forest Service 2010). Because the analysis was conducted for multiple emission sources simultaneously, both the BLM 10 percent change in extinction (1.0 dv) "just noticeable change" threshold and the National Park Service 5 percent change in extinction (0.5 dv) "half a noticeable change" adverse impacts threshold were used to assess the significance of potential impacts. FLAG 2010 relies on EPA's Regional Haze Rule Best Available Retrofit Technology (BART) Guidance, as follows: "In its BART guidelines, EPA indicated that for regional haze, a source whose 98th percentile value of the haze index is greater than 0.5 deciview (dv) (approximately a 5 percent change in light extinction) is considered to contribute to regional haze visibility impairment. Similarly, a source that exceeds 1.0 dv (approximately a 10 percent change in light extinction) causes visibility impairment." Results of the visibility analyses are presented in Table 4-5.

Table 4-5. Results of Visibility Analyses

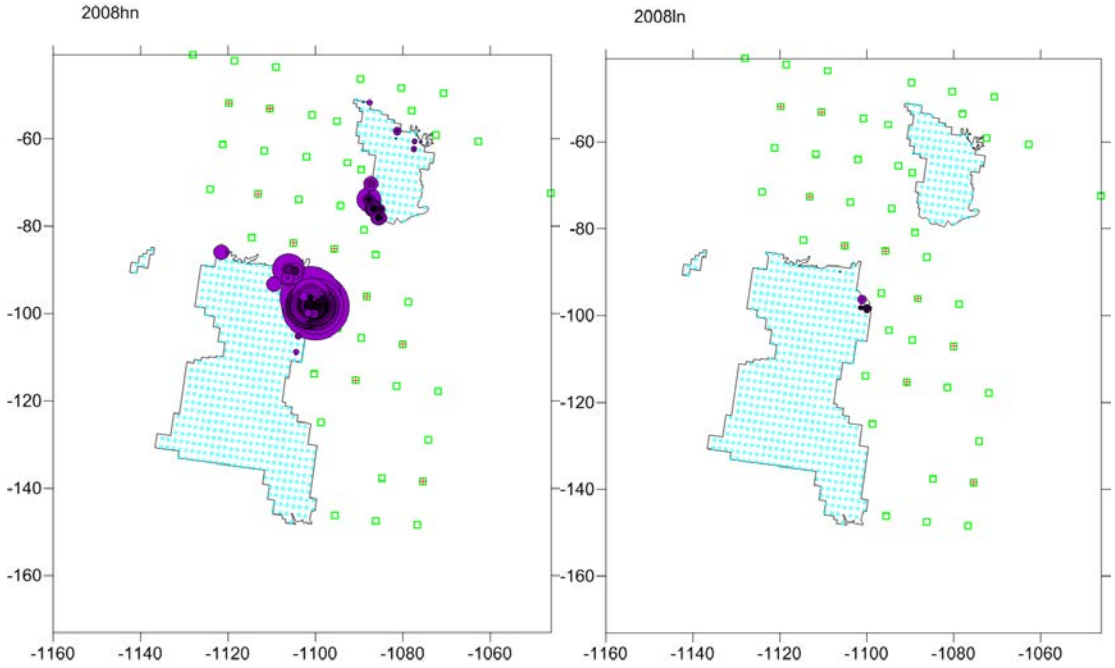
Meteorological Data Year	Days > 0.5 dv	Days > 1.0 dv	Max % change dv
Arches National Park – Visibility			
2006			
High	22	1	12.20%
Med	1	0	5.05%
Low	0	0	2.90%
2007			
High	14	1	10.03%
Med	0	0	4.28%
Low	0	0	2.35%
2008			
High	83	13	19.41%
Med	7	0	8.59%
Low	0	0	4.59%
Canyonlands National Park – Visibility			
2006			
High	53	11	20.39%
Med	5	0	8.94%
Low	0	0	4.50%
2007			
High	42	8	14.05%
Med	6	0	6.18%
Low	0	0	3.52%

Meteorological Data Year	Days > 0.5 dv	Days > 1.0 dv	Max % change dv
2008			
High	159	86	46.74%
Med	71	23	19.30%
Low	22	0	9.83%

Modeled visibility impacts ranged from greater than 0.5 dv impacts on almost half the year (159 days) at Canyonlands National Park during the 2008 meteorological year for the high emissions scenario, to no visibility impacts greater than 1.0 dv at any park for any meteorological year under the low emissions scenario. Coarse particulate (PM_{10}), primarily road dust from truck traffic on unpaved roads, was the dominate pollutant of concern under both high and medium emissions scenarios. Under the low emissions scenarios nitrogen oxides play a greater role in visibility impacts. The specific meteorological year used in the analysis also had a significant influence on modeled impacts. Meteorology in 2008 had substantially greater levels of impacts across the board compared to the previous two years of meteorological data. This indicates sensitivity to meteorological variability, and given the large role particulates play, adverse visibility impacts can most likely be tied to drier, hotter, and/or windier conditions.

Another tool the far-field modeling analysis provides is an indication of the magnitude of visibility impact as a function of proximity of the source in relation to the modeled receptor. Figure 4-1 is a geographical representation of the far-field modeling domain showing the two National Parks in the Planning Area. The small circles with embedded crosses represent modeled source locations. The "2008hn" represents the high emissions scenario for metrological year 2008, while "2008ln" represents the low emissions scenario for the same year. The size of the colored circles is a relative visual quantification of the magnitude of the impact to a receptor located at the center of that circle. It can clearly be seen that the magnitude of the emissions is a determinant factor in the magnitude of the visibility impact on receptors. The proximity of the sources also plays a determinant factor in the location of the impacts, as those park locations closest to modeled higher density sources are also where the higher impacts are located. Locations farther removed from source activities appear to be relatively unaffected by modeled source emissions.

Figure 4-1. Geographical Representation of Far-Field Modeling



Additional detailed information on parameters used and assumptions made for this analysis are available in Appendix F.

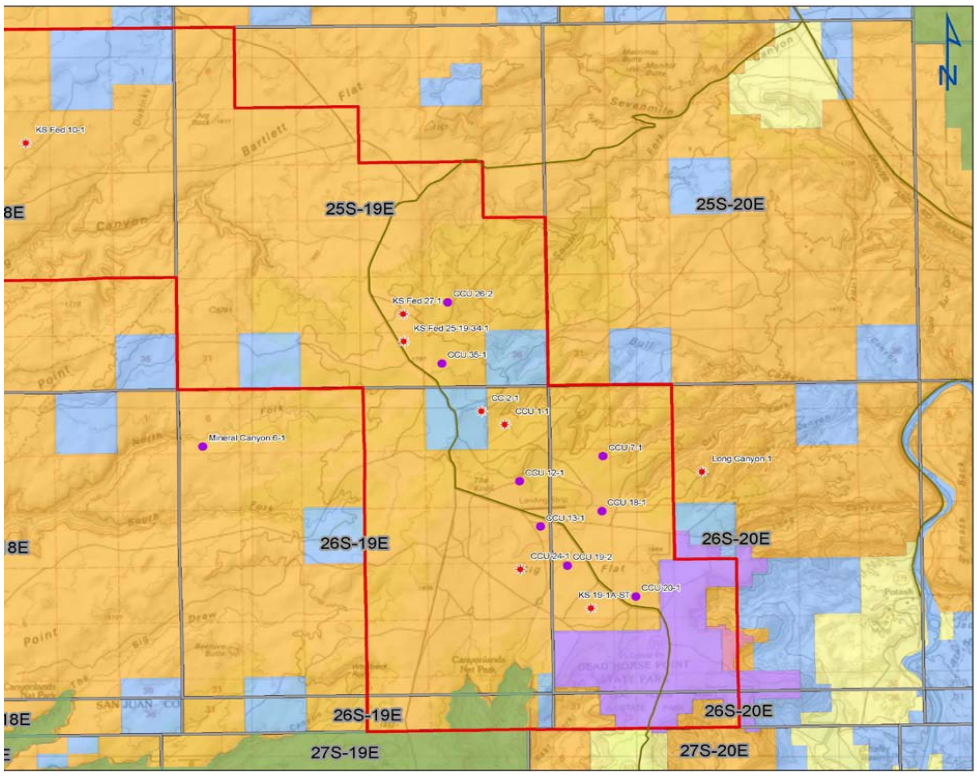
Near-Field Analysis

Near-field modeling analyses evaluate impacts of single or closely grouped sources on receptors in close proximity, typically less than a kilometer away. Specific characteristics of the source to be modeled (e.g., stack heights, emissions rates, etc.) are required to conduct this analysis, and, given the nature of this planning level air quality analysis, that information is not available. The BLM, through lease notices and subsequent NEPA analyses for specific projects, can and does require near-field modeling when emissions and other factors warrant it. For purposes of this MLP analysis an evaluation of previous near-field modeling that was conducted for specific projects in and near the Planning Area will be presented for relevance to management decisions and possible control considerations.

Cane Creek Near-Field Air Quality Impact Assessment

The Fidelity Cane Creek project included the addition of nine exploratory oil and gas wells to eight existing wells that were currently in production. Figure 4-2 provides a map that shows the existing and proposed wells spread over a relatively wide geographical area and the nearest park boundaries (shown in green). Annual emissions for the maximum 12-month period were approximately 100 tons for nitrogen oxides (NOx) and less than 25 tons for PM_{10}. These emissions decreased rapidly in each successive year as the rate of natural gas production declined steeply from new wells. Natural gas is controlled by thermal oxidation with flares.

Figure 4-2. Locations of Existing/Proposed Well Sites and National Parks



Golder, Incorporated, performed the following modeling for the BLM in 2010 to support a near-field assessment of impacts to air quality from the eight existing and nine proposed wells:

- NO_2 and PM_{10} Class I PSD Increment Consumption using AERMOD
- Nitrogen deposition within National Parks using CALPUFF-lite
- Visibility impacts within National Parks using VISCREEN.

NO_2 and PM_{10} Class I Prevention of Significant Deterioration Increment Consumption Using AERMOD
The EPA-approved AERMOD model was used in conjunction with five years of Canyonlands Field Airport meteorological data (2005-2009) obtained from UDEQ to predict maximum NO_2 and PM_{10} concentrations within the National Parks. These concentrations were compared to EPA Class I PSD Increments to determine the maximum percentages they represent.

Modeled emission rates for annual assessments (annual NO_2 and annual PM_{10}) were based on the highest-emitting 12-month period over the timeframe of construction and operation detailed in the 2009 Emissions Report. Modeled emission rates for the 24-hour PM_{10} assessment were based on the highest emitting calendar day. All predicted impacts were well below associated increments, as shown in Table 4-6.

Table 4-6. AERMOD NO_2 and PM_{10} Results

Pollutant	Maximum (µg/m3)	Increment (µg/m3)	Maximum Concentration as a Percent of the Increment
Annual NO_2	0.40	2.5	16.0%
Annual PM_{10}	0.35	4.0	8.8%

Pollutant	Maximum (µg/m3)	Increment (µg/m3)	Maximum Concentration as a Percent of the Increment
24-Hour PM_{10}	4.5	8.0	56.3%

Nitrogen Deposition Within National Parks using CALPUFF-lite

The annual nitrogen deposition rate resulting from NOx emissions from proposed project sources was assessed using the CALPUFF air dispersion model in conjunction with one year of meteorological data from the Canyonlands Field Airport processed by the AERMOD meteorological pre-processor (AERMET). A single year (2009) was used for this assessment as CALPUFF cannot process meteorological data with missing data. The remaining years (2005 through 2008), which had significant missing data, were used to fill in missing temperatures, wind speeds, and wind directions for 2009. Modeled nitrogen deposition rates were compared against the DAT for Western Class I areas presented in the June 27, 2008, Draft FLAG Phase I Report.

Modeled emission sources and rates used in the CALPUFF assessment were the same as those used for the annual NOx increment consumption analysis described above (i.e., highest emitting 12-month period over the construction and operation phases). A second modeling analysis was conducted to assess the effect of decreasing NOx emission rates (i.e., 101 tons per year [tpy] for the maximum emitting 12-month period versus 77 tpy for year 3) on the nitrogen deposition rates. The second CALPUFF modeling assessment used emission estimates for the year immediately following the highest emitting 12-month period. Table 4-7 presents the results of the nitrogen deposition modeling for the highest-emitting 12-month period (Year 2) and for the year (Year 3) immediately following the highest emitting 12-month period.

Table 4-7. CALPUFF Nitrogen Deposition Results

Pollutant	Basis for Emission Rates (from 2009 Emissions Report)	Maximum Modeled Deposition Rate (wet plus dry) ($\mu g/m^2/s$)	Maximum Modeled Deposition Rate (wet plus dry) (kg/ha/yr)	Deposition Analysis Threshold (DAT) For Class I Areas (kg/ha/yr)
Total Nitrogen	Year 2 (maximum)	3.7E-05	0.012	0.005
Total Nitrogen	Year 3	2.5E-05	0.008	0.005

The maximum modeled nitrogen deposition rate shown in Table 4-7 is above the DAT. However, the "Guidance on Nitrogen and Sulfur Deposition Analysis Threshold" document available on the NPS FLAG website states that "…the DAT is a deposition threshold, not necessary an adverse impact threshold." The DAT is used to assess potential ecosystem chronic exposures to project emissions expected to be permanent and constant over very long periods. The Cane Creek project will have steadily declining NOx emissions and associated impacts over time as demonstrated in this analysis. This short-term, worst-case 12-month prediction is not directly comparable to the long-term deposition impacts reflected in the DAT. Additionally, the modeling conducted for this assessment used a simplified one-year meteorological data set instead of a full, three-dimensional wind field-based data set for three years, which would likely show lower deposition rates than presented.

For comparison, the U.S. Forest Service "level of concern" for nitrogen deposition is roughly three orders of magnitude greater at 3 kg/ha/yr (or 1,215 grams/acre/year) compared to the 0.005 kg/ha/yr (or 2 grams/acre/year) for the NPS DAT. Given the screening nature of the assessment, the relatively brief period that the modeled deposition rate would be above the DAT and the simplistic chemical transformation

scheme used, it is not expected that the proposed project would have an adverse impact from nitrogen deposition in Canyonlands or Arches National Parks.

Visibility Impacts Within National Parks using VISCREEN

Potential visibility impacts within the National Parks were evaluated using the single source VISCREEN model, in accordance with the procedures provided in the EPA's "Workbook for Estimating Visibility Impacts" (EPA 1980). A Level 1 assessment was performed for each of two scenarios, the well closest to the Arches National Park (well location 7-1) and one for the well closest to the Canyonlands National Park (well location 19-1). These individual well analyses reflect the single emission point limitation of VISCREEN. Separate VISCREEN model runs were conducted for worst-case emissions during the construction phase of the well, and for the ongoing operation of the well.

Potential visibility impacts, or the maximum degree of plume visibility, from the proposed wells nearest to the parks, were evaluated against Delta E criteria of 2.0 and Contrast criteria of 0.05. The VISCREEN results are less than the default criteria in every case, as shown in Table 4-8 and Table 4-9, indicating no adverse effect on visibility from the proposed project in the two nearby National Parks.

Table 4-8. VISCREEN Modeling Results of Plume Visibility Inside Arches National Park

Scenario	Assessment	Delta E		Contrast	
		Result	Criterion	Result	Criterion
Construction	Sky 1	0.92	2.00	-0.02	0.05
Construction	Sky 2	0.79	2.00	-0.02	0.05
Construction	Terrain 1	0.89	2.00	0.01	0.05
Construction	Terrain 2	0.65	2.00	0.01	0.05
Operations	Sky 1	0.15	2.00	0.00	0.05
Operations	Sky 2	0.12	2.00	0.00	0.05
Operations	Terrain 1	0.12	2.00	0.00	0.05
Operations	Terrain 2	0.10	2.00	0.00	0.05

Table 4-9. VISCREEN Modeling Results of Plume Visibility Inside Canyonlands National Park

Scenario	Assessment	Delta E		Contrast	
		Result	Criterion	Result	Criterion
Construction	Sky 1	1.42	2.00	-0.02	0.05
Construction	Sky 2	1.19	2.00	-0.02	0.05
Construction	Terrain 1	0.36	2.00	0.00	0.05
Construction	Terrain 2	0.10	2.00	0.00	0.05
Operations	Sky 1	0.23	2.00	0.00	0.05
Operations	Sky 2	0.18	2.00	0.00	0.05
Operations	Terrain 1	0.03	2.00	0.00	0.05
Operations	Terrain 2	0.02	2.00	0.00	0.05

Based on the modeled results presented above, predicted impacts from project emissions to air quality resources within Canyonlands and Arches National Parks are minimal and generally below guideline criteria. Predicted nitrogen deposition, for which the NPS DAT threshold is based on chronic, long term exposure and not short-term, worst-case project emissions, was comparably low, only slightly above the NPS DAT, and significantly below the U.S. Forest Service (USFS) "level of concern" concentration. In the case of the proposed project, emissions will decrease rapidly as construction activities conclude and as gas production rates mature. All modeling analyses were conservatively based on the maximum 12-month period projected emissions from the 2009 Emissions Report previously submitted.

Monument Buttes Environmental Impact Statement Near-Field Modeling Analysis

Near-Field Criteria Pollutant Impacts Other than Ozone

To assess the potential air quality impact of the emissions associated with a proposal for drilling 5,750 wells, EPA-recommended dispersion models were used with meteorological data from Vernal, Utah. The criteria pollutant impacts were evaluated using a near-field model, AERMOD, and compared to ambient air quality standards. The criteria pollutants evaluated were PM_{10}, $PM_{2.5}$, NO_2, SO_2, and CO. The highest possibility of emissions for PM_{10} and $PM_{2.5}$ takes place during the construction and development phase of the project. The highest possibility of emissions for NOx, CO, and SO_2 takes place during the operations and infrastructure phases of the project. Each pollutant was modeled under the maximum development and operational scenarios of the proposal, which includes drilling during the maximum operation year. Emissions are shown in Tables 4-10 and 4-11.

Table 4-10. Maximum Potential Construction and Development Air Quality Impacts for the Monument Buttes Project

Pollutant	Averaging Period	Ambient Air Concentration (µg/m3)					
		Year of Maximum Impact	Location of Maximum Impact	Modeled Impact	Background	Total	NAAQS
PM_{10}	24-hour	2007	100 m west of pad construction	72.5	18.7	91.2	150
$PM_{2.5}$	24-hour	NA	200 m SE of pad construction	14.3	17.8	32.1	35
	Annual	2005	100 m east of producing wells	1.4	8.0	9.4	12

Table 4-11. Maximum Potential Operations Air Quality Impacts for the Monument Buttes Project

Pollutant	Averaging Period	Ambient Air Concentration (µg/m3)					
		Year of Maximum Impact	Location of Maximum Impact	Modeled Impact	Background	Total	NAAQS
CO	1-hour	2007	100 m north of compressor station	276	2,641	2,917	40,000
	8-hour	2009	100 m east of GOSP	137	1,657	1,794	10,000

Pollutant	Averaging Period	Ambient Air Concentration (µg/m3)					
		Year of Maximum Impact	Location of Maximum Impact	Modeled Impact	Background	Total	NAAQS
NO_2	1-hour	NA	100 m east of producing wells	106.9[a]	57.7	164.6	188
	Annual	2005	100 m east of producing wells	16.5	7.3	23.8	100
SO_2	1-hour	NA	100 m east of GOSP	0.7	20.1	20.8	196
	3-hour	2006	100 m south of GOSP	0.6	14.3	14.9	1,300

[a] Assumes Tier 2 NO to NO2 conversion of 80 percent

Potential Hazardous Air Pollutant Impacts

The potential impact of emissions from acrolein, benzene, and formaldehyde were modeled. These three hazardous air pollutants (HAP) were selected due to their relatively high emission rates and relatively low Relative Exposure Levels (REL), Reference Concentrations (RfC), and Toxic Screening Levels (TSL). For non-carcinogenic effects, the modeled impacts for the proposal were compared to the RELs, RfCs, and TSLs as shown in Table 4-12 for operational impacts. HAP impacts were not modeled for the construction and development phase of the project because the emissions are so much smaller than during operations. None of the impacts are greater than the evaluation criteria. The modeled impacts shown in Table 4-12 are the maximum impact from either the oil well modeling scenario or the gas well scenario, depending on which impact is greater.

Table 4-12. Hazardous Air Pollutant Air Quality Impacts During the Operations Phase for the Monument Buttes Project

Pollutant and Averaging Time	Averaging Period	Maximum Impact Year	Modeled Maximum Impact (µg/m3)	Relative Exposure Levels (µg/m3)	Reference Concentrations (µg/m3)	Toxic Screening Levels (µg/m3)
Acrolein	Annual	2006	0.18	NA[a]	0.35	NA
	1-hour	2006	1.50	2.5	NA	23
Benzene	Annual	2005	0.30	NA	30	NA
	1-hour	2005	5.55	1,300	NA	18[b]
Formaldehyde	Annual	2006	1.27	NA	9.8	NA
	1-hour	2007	12.32	55	NA	37

[a] NA means that the criterion is not applicable for the averaging time noted, i.e., there is no value.

[b] The TSL for benzene is a 24-hour average, but the 1-hour concentration is conservatively compared to the TSL.

Potential carcinogenic effects are evaluated by calculating the probability of contracting cancer due to continuous exposure to carcinogenic HAPs. The carcinogenic HAPs of interest are formaldehyde and benzene. The results are shown in Table 4-13 for operational impacts of the Monument Buttes project.

Cancer risk is calculated for both the Maximum Likely Exposure (MLE) and the Maximum Exposed Individual (MEI). The MLE risk value is a more realistic, yet a very conservative over-estimate of potential cancer risk than the MEI risk value. MLE exposure is based on a 9-year exposure, which is the average duration that a person resides at a single location. MEI is based on continuous exposure for the life of the project (15 years). Potential cancer risk is not calculated for construction and development impacts since the potential emissions of carcinogenic HAPs are much less than for operational impacts.

Table 4-13. Potential Carcinogenic Risk for the Operations Phase of the Monument Buttes Project

Exposure Scenario	HAP	Unit Risk Factor (1/µg/m3)	Exposure Adjustment Factor	Modeled Annual Impact (µg/m3)	Cancer Risk
MLE	Benzene	2.2 x 10-06 to 7.8 x 10-06	0.095	0.30	6.2 x 10-08 to 2.2 x 10-07
	Formaldehyde	1.3 x 10-05	0.095	1.27	1.6 x 10-06
	Total MLE Risk				**1.8 x 10-06**
MEI	Benzene	2.2 x 10-06 to 7.8 x 10-06	0.571	0.30	3.8 x 10-07 to 1.3 x 10-06
	Formaldehyde	1.3 x 10-05	0.571	1.27	9.4 x 10-06
	Total MEI Risk				**1.1 x 10-05**

The maximum likely exposure impact reported in Table 4-13 is a potential carcinogenic risk of 1.8 in a million. This value is an over-estimate and not likely to occur as it assumes that a person is exposed outside continuously for 9 years at a location immediately adjacent to a worst-case set of emitting devices operating continuously at maximum production. Therefore, the potential risk is less than the acceptable range of risk published by the EPA of 1 to 100 in a million (EPA 1993).

Greenhouse Gas Analysis

GHG emissions were derived for the projected development for each alternative using an emissions calculator developed for BLM specifically for oil and gas operations (http://www.blm.gov/ut/st/en/prog/more/air_quality/airprojs.html). Total estimated emissions in carbon dioxide equivalents are shown in Table 4-14. To place these emissions estimates into context, comparing the maximum GHG emissions estimate from Alternative A to the annual United States CO_{2eq} emissions in 2012 of 6,525,000,000 metric tons[2] yields a ratio of 0.00003 percent as a percentage of total US GHG emission. Compared to Utah-specific GHG emissions, in 2010, Utah had 63,400,000 tons of GHG emissions, which yields a ratio of 0.003 percent as a percentage of total Utah GHG emissions (Center for Climate Strategies 2010). CO_{2eq} emissions from potash operations were not calculated as there is not enough development, operations, or emission factors information available to make that calculation.

Total CO_{2eq} GHG emissions would be expected to be less than a thousandth of a percent of total United States CO_{2eq} GHG emissions. It is not currently possible to calculate an impact from this number, or to assign a significance value to these calculated emissions. They are reported per CEQ and EPA guidance related to the quantification of GHG emissions from oil and gas projects in NEPA.

Table 4-14. Estimated Greenhouse Gas Emissions by Alternative

Alternative	CO_{2eq}. Emissions (tons per year)[1, 2]
A	200,302
B1	131,548
B2	93,633
C	30,840
D	145,775

[1]http://www.blm.gov/ut/st/en/prog/more/air_quality/airprojs.html
[2]EPA 2013

Results of Air Quality Modeling and Quantitative Analysis

Under all alternatives, it is unlikely the NAAQS will be exceeded or violated due to BLM-approved development actions related to oil and gas and/or potash development. Based on previous modeling, there is a possibility of short-term exceedances of the 1-hour NO_2 and 24-hour PM_{10} NAAQS from development activities. These exceedances would most likely be short-lived and spatially variable, and a violation would be unlikely. Deposition of nitrogen and sulfur in Class 1 Areas (National Parks) due to actions related to oil and gas and/or potash development, in all alternatives, are unlikely to result in concentrations exceeding Deposition Analysis Thresholds (DAT), although under the higher emissions scenarios modeled nitrogen exceeded the DATs. DATs are established by the National Park Service to protect ecological integrity in National Parks and wilderness areas. Deposition trends in nearby Class 1 Areas have been steady to improving in recent decades, although under higher emissions scenarios, this could be reversed. Given the very low PSD increment consumption identified in tiered project-specific analysis discussed above, and the lack of any current or proposed major sources of emissions in the Planning Area, it is unlikely that PSD increment consumption is or could become an issue in the Planning Area.

Modeled visibility impacts to adjacent Class 1 Areas (Arches and Canyonlands National Parks) appear to be sensitive to likely emissions from both development and production activities related to both oil and gas and potash. Based on the modeling results and assumptions, visibility impacts appear to be especially sensitive to emissions of PM_{10} (course particulate, e.g., road dust) and to a lesser extent, emissions of elemental carbon (e.g., diesel soot) and NOx. In addition, proximity of emission sources, in particular PM sources, play a large role in the magnitude and frequency of modeled adverse visibility impacts to the AQRVs of the National Parks.

4.3.3 Impacts Common to All Alternatives

The following discussions represent impacts on air resources that would not vary by alternative.

Compliance with Utah Air Conservation (UAC) regulations, State of Utah Air Quality Standards, and National Air Quality Standards, along with quantitative analysis of potential Air Quality impacts for project-specific developments would all maintain air quality in the Planning Area.

Applying no surface occupancy (NSO) stipulations and not allowing mineral leasing and other surface-disturbing activities would reduce impacts to air quality by limiting activities that could cause increased air emissions and fugitive dust.

Avoiding or minimizing surface-disturbing activities could reduce air emissions during the nesting season for migratory birds (April 1 to July 31). Restricting surface-disturbing activities near special status species'

breeding, nesting, and winter habitats in the summer months, and near bighorn sheep lambing and rutting areas for the Lockhart desert bighorn sheep herd (55,561 acres) from April 1 through June 15 and October 15 through December 15, could reduce air emissions during these timeframes. However, these restrictions could redirect air emissions toward the other months (such as winter).

4.3.4 Impacts from Alternative A (No Action)

Utilizing best management practices (BMP) and site specific mitigation measures, when appropriate, based on site specific conditions, to reduce emissions and enhance air quality, and requiring a Lease Notice and a Condition of Approval for Applications for Permit to Drill to implement nitrogen oxide control measures for compressor engines would minimize air emissions and maintain Air Quality in the Planning Area.

Under this alternative, both oil and gas leasing and potash leasing could occur on the same tract of land, which could result in redundant infrastructure. Approximately 210,884 acres would be open to mineral leasing, subject to standard terms and conditions. Mineral leasing activities cause emissions of criteria air pollutants plus HAPs and GHGs. Additionally, construction of oil and gas facilities can result in particulate emissions from fugitive dust and/or other criteria pollutant emissions from soil disturbances during well pad and access road development, construction-related travel, and use of heavy equipment, including during evaporation pond construction.

Controlled Surface Use (CSU) and Timing Limitations (TL) stipulations would be applied to 440,386 acres. CSU and TL stipulations would minimize the amount of surface-disturbing activities that occur, and could also provide indirect protections to air emissions. For example, applying TL stipulations to wildlife habitat could all reduce air emissions during the timeframes the stipulations are in place. However, these restrictions could redirect air emissions toward the other months (such as winter).

The NSO stipulation for mineral leasing to 133,574 acres open to mineral leasing would further minimize surface-disturbing activity associated with mineral leasing, associated air emissions and fugitive dust. Closing areas to mineral leasing (753 acres) would prevent surface disturbance and maintain air quality in these areas.

Developing BMPs to address health and safety concerns associated with blowing dust along U.S. 191 and I-70 would likely result in decreased particulate emissions associated with fugitive dust, and maintain or improve air quality in these areas. Establishing criteria for restricting activities during drought that would include no new surface-disturbing activities could provide indirect protections to air quality, as particulate emissions associated with mineral leasing activities would be limited.

4.3.5 Impacts from Alternative B

Impacts Common to Alternative B

Under this alternative, maximizing lease parcel size could reduce redundant infrastructure and corridors, which could lessen fugitive dust by reducing the amount of roads and reducing emissions due to limiting the number of operators in the same area, compared to Alternative A.

Applying CSU stipulations for mineral leasing could minimize new emission sources by limiting mineral leasing operations in these areas. A CSU stipulation that would require mitigation of impacts to air quality and greenhouse gas emissions and a CSU stipulation requiring mitigation of potential impacts from mineral development on regional ozone formation would provide greater protection to air quality than in Alternative A. Additionally, requiring a Fugitive Dust Control Plan for mineral activities that would disturb a surface area larger than 0.25 acres or that would involve truck traffic on unpaved or untreated surfaces, and applying

BMPs to minimize dust generate from mineral activities could reduce particulate emissions from fugitive dust and maintain air quality to a greater degree than Alternative A.

Applying NSO stipulations for mineral leasing would provide further localized and/or regional protections to air quality than Alternative A by preventing the surface-disturbing activities associated with mineral leasing.

Applying BMPs to minimize emissions resulting from mineral operations would lessen impacts to regional air quality.

Applying BMPs to reduce fugitive dust in all soils and especially those with high and moderate wind erosion ratings would provide the same protections to air quality as discussed in Alternative A, but to a greater extent as the area of application would cover more acres. Also, compared to Alternative A, applying a CSU stipulation for activities on slopes greater than 2 percent throughout the Planning Area could result in increased protections to air quality, as the slope threshold would be less (21 percent compared to 30 percent for Moab and 21 percent – 40 percent for Monticello) and the CSU stipulation would cover the entire Planning Area (181,110 acres).

Applying BMPs during extreme and exceptional droughts to reduce dust production would provide protections to air quality by minimizing the amount of particulate emissions, similar to Alternative A.

Impacts Specific to Alternative B1 Only

Deferring the issuance of new oil and gas leases within PLAs (103,619 acres) could help to minimize adverse impacts to air quality found within these areas. These adverse impacts could result from concurrent oil and gas development and potash development that could occur under Alternative A. However, 43 percent of the Hatch Point PLA contains existing oil and gas leases. There is potential for concurrent development of oil and gas and potash on these existing leases and a greater likelihood for adverse impacts to air quality. Allowing potash leasing and development within PLAs on 103,619 acres could result in adverse impacts to air quality that may be found in these areas from surface- and subsurface-disturbing potash related activities. If the acreage encompassed by PLAs were to become subject solely to oil and gas leasing and development, the adverse impacts to air quality would be similar to or less than the impacts identified for potash leasing and development. Alternative B1 defers a decision for potash leasing on 681,948 acres within the Planning Area, which would minimize adverse impacts to air quality from concurrent oil and gas and potash development as compared to Alternative A.

Under this alternative, the areas open to oil and gas and potash leasing with standard terms and conditions in Alternative A (210,884 acres) would be subject to further stipulations or closed entirely, which would reduce the impacts to air quality in these areas as leasing activities and development would likely be reduced, compared to Alternative A.

PLAs would be identified in the Upper Ten Mile area (29,127 acres), the Red Wash area where potash prospecting permits have been issued (29,956 acres), and the Hatch Point area where potash prospecting permits have been issued (44,536 acres). The PLAs would total 103,619 acres. These designations would impact air quality in these areas because in these areas, air emissions and surface-disturbing activities associated with potash leasing would likely increase.

Applying a phased leasing approach to potash leasing would minimize air emissions from potash leasing operations over the long term as compared to Alternative A.

Within PLAs, CSU and TL stipulations for potash leasing would be applied to 57,620 acres. About 45,999 PLA acres would be subject to NSO stipulations, and 681,948 acres would be deferred for potash leasing.

As there are fewer acres subject to potash leasing as compared to Alternative A, Alternative B1 provides greater protection to air quality.

Applying the CSU stipulation to all potash leases that require processing facilities to be located within a PPFA (42,492 acres) could minimize impacts to air quality across the Planning Area by concentrating processing facilities and associated air emissions. However, areas where facilities are located could experience a localized or regional increase in air emissions, including fugitive dust, both during initial construction and in the long-term as operations continue.

Minimizing the amount of surface disturbance and related impacts resulting from mineral development through application of the Baseline CSU stipulation on lands identified with sensitive resources (208,185 acres) could indirectly minimize air quality impacts in these areas, as stipulations including multiple well pads and collocating production facilities could reduce air emissions from mineral operations, and avoid redundant emission sources. Additionally, surface disturbances associated with mineral leasing activities would be reduced.

CSU and TL stipulations for oil and gas leasing would be applied to 228,926 acres. However, 452,269 acres would be subject to NSO stipulations, 753 acres would be closed (same as Alternative A), and 103,619 acres within the PLAs would be deferred to oil and gas leasing. Although there would be less acres subject to CSU and TL stipulations, as compared to Alternative A, there would be greater acreage subject to NSO stipulations or deferred to oil and gas leasing, which would provide greater protections to air quality in the Planning Area.

Impacts Specific to Alternative B2 Only

Under this Alternative, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. There would be no potash leasing throughout the Planning Area (785,567 acres), which would result in increased protections to air quality in the Planning Area, compared to Alternative B1, as no surface-disturbing activities associated with potash leasing would occur.

The open leasing areas in Alternative A (210,884 acres) would be subject to further stipulations or closed entirely, which would reduce the impacts to air quality in these areas because oil and gas development would likely be reduced, compared to Alternative A.

CSU and TL stipulations for oil and gas leasing would be applied to approximately 285,806 acres. Approximately 499,008 acres would be subject to NSO stipulations, and 753 acres would be closed to oil and gas leasing. Although there would be fewer acres subject to CSU and TL stipulations, as compared to Alternative A, there would be greater acreage subject to NSO stipulations, which would provide greater protections to air quality in the Planning Area.

Minimizing the amount of surface disturbance and related impacts resulting from oil and gas development through application of the Baseline CSU on lands identified with sensitive resources (222,289 acres) would provide protections to air quality. Stipulations including multiple well pads, collocating production facilities, and reclamation requirements would all minimize surface impacts and the resulting air emissions typically associated with oil and gas leasing.

4.3.6 Impacts from Alternative C

Under this alternative, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. There would be no potash leasing throughout the Planning Area (785,567 acres), which would result in increased protections to air quality in the Planning Area.

The areas open to oil and gas leasing with standard terms and conditions in Alternative A (210,884 acres) would be subject to further stipulations or closed entirely, which would reduce the impacts to air quality in these areas as oil and gas development would likely be reduced, compared to Alternatives A and B.

Applying the Baseline CSU stipulation, the CSU stipulations for air quality, and the CSU stipulation requiring a Fugitive Dust Control Plan would have the same impact to air quality as described in Alternative B.

Maximizing lease parcel size could provide the same reductions to air emissions as discussed in Alternative B.

Applying BMPs to minimize emissions resulting from mineral operations would lessen impacts to regional air quality, similar to Alternative B.

Application of BMPs during extreme and exceptional droughts to reduce dust production would provide protections to air quality by minimizing the amount of particulate emissions, similar to Alternatives A and B.

CSU or TL stipulations for oil and gas leasing would be applied to 54,799 acres. An NSO stipulation for oil and gas leasing would be applied to 550,599 acres, and 180,169 acres would be closed to oil and gas leasing. Although there would be fewer acres subject to CSU and TL stipulations, compared to Alternative A, there would be a much greater amount of acreage either subject to NSO stipulations, or entirely closed, which could reduce or prevent surface-disturbing activities from oil and gas development in these areas, compared to Alternatives A and B.

4.3.7 Impacts from Alternative D

Deferring the issuance of new oil and gas leases within PLAs (103,619 acres) would provide the same protections to air quality as discussed in Alternative B1. Applying a phased leasing approach to limit potash leasing would have the same impacts to air quality as discussed in Alternative B1.

Applying CSU stipulations for mineral leasing could minimize new emission sources by limiting mineral leasing operations in these areas. A CSU stipulation that would require mitigation of impacts to air quality and greenhouse gas emissions and a CSU stipulation requiring mitigation of potential impacts from mineral development on regional ozone formation would provide greater protection to air quality than in Alternative A and the same as Alternatives B and C. Additionally, requiring a Fugitive Dust Control Plan for mineral activities that would disturb a surface area larger than 0.25 acre or that would involve truck traffic on unpaved or untreated surfaces, and applying BMPs to minimize dust generate from mineral activities could reduce particulate emissions from fugitive dust and maintain air quality to a greater degree than Alternative A and the same as Alternatives B and C.

Designating a PLA in the Upper Ten Mile area, the Red Wash area where potash prospecting permits have been issued, and the Hatch Point area where potash prospecting permits have been issued would have the same impacts to air quality as discussed under Alternative B1.

Under Alternative D, areas open to leasing with standard terms and conditions in Alternative A (210,884 acres) would be subject to further stipulations or closed entirely, which would reduce the impacts to air quality resources in these areas as leasing activities and development would likely be reduced, compared to Alternative A and the same as Alternatives B and C.

CSU and TL stipulations for potash leasing would be applied to 57,308 acres. Applying a CSU stipulation to all potash leases that requires processing facilities to be located within a PPFA (42,492 acres) would have the same impacts to air quality as discussed in Alternative B1, apart from any area that would be granted an exception in the future. Under this Alternative, an exception to the PPFA stipulation could be granted for small-scale potash processing facilities located within the PLAs. If these smaller facilities were constructed, impacts to air quality could increase as compared to Alternative B1 due to increased surface-disturbing activities in these areas (no more than 100 acres).

An NSO stipulation for potash leasing would be applied to 46,311 acres, and 681,948 acres would be deferred. Although there would be fewer acres subject to CSU, TL, and NSO stipulations, compared to Alternative A, there would be less acreage subject to potash leasing, which would provide greater protections to air quality.

Maximizing lease parcel size could provide the same reductions in air emissions as discussed in Alternative B.

CSU and TL stipulations for oil and gas leasing would be applied to 230,765 acres, 305,899 acres would be subject to NSO stipulations, 145,284 acres would be closed, and 103,619 acres within the PLAs would be deferred. Although there would be fewer acres subject to CSU and TL stipulations, compared to Alternative A, there would be a much greater amount of acreage either subject to NSO stipulations, or entirely closed, which would provide greater protections to air quality.

Applying BMPs to minimize emissions resulting from mineral operations would lessen impacts to regional air quality, similar to Alternatives B and C.

Applying BMPs to reduce fugitive dust in all soils and especially those with high and moderate wind erosion ratings would have the same protections to air quality as discussed in Alternative A, but to a greater extent as the area of application would cover more acres. Application of BMPs during extreme and exceptional droughts to reduce dust production would provide protections to air quality by minimizing the amount of particulate emissions, similar to Alternatives A, B, and C.

4.4 CULTURAL RESOURCES

Because the majority of cultural resources that have been identified in the Planning Area consist of archaeological sites, the primary concern for impacts relates to disturbance of the artifacts, features, and architecture of sites in ways that reduce their integrity, alter their association with traditional values, and reduce the potential to recover data. Archaeological data consist of both "objects" (in the broad sense of artifacts, architecture, features, etc.), and the horizontal and vertical relationships between these objects. Our ability to interpret and understand the past is based on recovering not only the material culture of the past in the form of artifacts, buildings, and the built environment, but the spatial relationships between different aspects of material culture. Consequently, surface and subsurface disturbances have the greatest potential for adverse impacts on cultural resources. Impacts can include elimination or reduction of the setting and physical integrity of a sacred or other site, including National Register-eligible sites, landscapes, and cultural theme areas. Other impacts may include disruption or reduction of the religious values of sites and areas, reduction in the data potential of a site, and damage to traditional collection areas or resource sites.

In general, impacts on cultural resources from surface disturbance are long-term and permanent; once an archaeological site has been impacted, the effect typically cannot be reversed. However, as stated previously, short-term effects from visual or auditory impacts may occur, and can often be mitigated or accommodated. Potential impacts to specific cultural resources from the various proposed management alternatives are difficult to quantify precisely. The management alternatives neither stipulate precise locations for surface-disturbing activities, nor are the precise locations of all cultural resources in the area known. However, it is possible to estimate impacts based on the proposed general locations of activities within the Planning Area to zones that either have a high or low probability of containing cultural resources.

4.4.1 Assumptions

- Protection for all cultural resources would occur in accordance with Federal laws and BLM regulations and agreements, regardless of whether the resources are specifically identified in the Moab MLP/FEIS.

- Adverse impacts to cultural resources from surface-disturbing activities occur primarily at the time the initial surface disturbance occurs. Therefore, the projected numbers for short-term surface disturbance are used to quantify impacts to cultural resources.

- There is a direct correlation between the number of sites that could be impacted by various mineral actions and the degree, nature, and quantity of surface-disturbing activities allowed within the Planning Area. In general, the more surface disturbance associated with mineral development, the greater the likelihood for adverse impacts to cultural resources.

- There is a direct relationship between the frequency of human use in an area and the potential for indirect impacts to cultural resources.

4.4.2 Impacts Common to All Alternatives

Applying an NSO stipulation for mineral leasing in order to reduce surface use conflicts along the U.S. Highway 191 utility corridor within Moab Canyon (3,119 acres) could help to protect cultural resources that may occur within these areas.

Applying an NSO stipulation for mineral leasing in areas where mineral activities would be incompatible with existing surface use (Moab Landfill [82 acres], Moab Airport [296 acres], and Dead Horse Point State

Park [3,932 acres]) would help prevent damage to cultural resources within these areas that can be caused by surface-disturbing activities.

4.4.3 Impacts from Alternative A (No Action)

In Alternative A oil and gas and potash leasing and development could occur concurrently with the same tract of land, which could result in higher concentrations of development and redundant infrastructure. Although drilling for oil and gas and potash is similar, the production of potash requires the use of potash processing facilities, which involve large tracts of land over a long period of time. Mineral development would result in soil and vegetation disturbance that could adversely impact cultural resources.

Avoiding or minimizing impacts to traditional cultural properties (TCP) from development would help to protect these areas from surface-disturbing activities that could damage or destroy these sites.

Managing cultural plants to ensure that ground disturbing activities do not contribute to the decline of sensitive plant communities would help to protect these plants from potential damage from surface-disturbing activities.

Applying an NSO stipulation for mineral leasing within the area of the existing Three Rivers mineral withdrawal for locatable minerals (23,441 acres) could protect cultural resources (including the Denis Julien inscription along the Green River) from surface-disturbing activities in these areas.

Under Alternative A, about 651,270 acres are managed as open to leasing with standard terms and conditions or with CSU and TL stipulations, which comprises about 83 percent of the Planning Area. Within this area, projected development for oil and gas and potash would occur and the associated surface disturbance could adversely impact cultural resources. Because oil and gas and potash leasing and development, including potash processing facilities, could occur on the same tracts of land within these 651,270 acres, there is a higher likelihood for disturbance than would occur if the minerals were to be developed separately and thus more potential for adverse impacts to cultural resources.

The remaining 17 percent of the Planning Area is subject to NSO stipulations (133,574 acres) and closed to mineral leasing (753 acres). These major constraints would protect cultural resources within these areas by precluding surface mineral development.

The entire Planning Area has been assessed to determine the potential for the occurrence of cultural sites (see Map 3-2). Each acre of the Planning Area has been ranked as having high (157,911 acres with 17 percent of the Planning Area), medium (468,765 acres or 50 percent of the Planning Area), or low (319,789 acres or 33 percent of the Planning Area) potential for the occurrence of cultural sites. Table 4-15 presents the potential for the occurrence of cultural sites by alternative and mineral leasing decision (in acres).

Table 4-15. The Potential for the Occurrence of Cultural Sites by Alternative and Mineral Leasing Decision (in acres)

Cultural Site Occurrence Potential	Alternative A	Alternative B	Alternative C	Alternative D
Open to Leasing with Standard Terms and Conditions				
High Potential	22,899	0	0	0
Medium Potential	66,881	0	0	0
Low Potential	120,352	0	0	0

Cultural Site Occurrence Potential	Alternative A	Alternative B	Alternative C	Alternative D
Open to Leasing with CSU and/or TL stipulations				
High Potential	73,379	39,716	8,782	40,763
Medium Potential	147,179	82,405	17,648	83,309
Low Potential	120,352	163,684	28,369	164,001
Managed with an NSO stipulation				
High Potential	39,424	96,452	92,841	78,192
Medium Potential	46,281	178,656	174,172	120,175
Low Potential	46,858	223,900	283,568	155,742
Closed to Leasing				
High Potential	77	77	34,623	17,290
Medium Potential	304	304	69,613	57,949
Low Potential	372	372	75,933	70,045

4.4.4 Impacts from Alternative B

Applying a Lease Notice would help to mitigate impacts to TCPs and cultural plants from surface-disturbing activities.

Applying an NSO stipulation up to a 0.5 mile radius that is visible or audible from highly visited cultural sites or cultural concentration areas (22,328 acres) would help protect these areas from surface-disturbing activities, as well as to protect the visitor experience at these locations.

Applying a Lease Notice requiring viewshed assessment would help to protect cultural resources from surface-disturbing activities in these areas, as well as protect the visitor experience to these locations.

Applying a Lease Notice to areas of high probability of cultural site occurrence and informing the operator that it may be more difficult or costly to exercise lease rights could help to protect cultural resources that may be found in these areas from surface-disturbing activities. This Lease Notice involves 136,245 acres.

Impacts from applying an NSO stipulation for mineral leasing within the area of the existing Three Rivers mineral withdrawal for locatable minerals (23,441 acres) would be the same as those described in Alternative A. This area includes the Denis Julien inscription along the Green River.

Maximizing the size of oil and gas lease parcels could potentially reduce the number of operators, redundant infrastructure, and corridors, thereby reducing the potential impacts to cultural sites.

Implementing BMPs to minimize the potential resource impacts associated with mineral development could prevent or reduce surface impacts caused by mineral development, thereby preventing damage to cultural resources from such activities.

Applying a Baseline CSU stipulation to oil and gas and potash leasing in areas with sensitive resources in order to minimize the amount of surface disturbance and related impacts resulting from mineral development could reduce adverse impacts to cultural resources within these areas as compared to

Alternative A. The Baseline CSU stipulation would apply to 208,185 acres in Alternative B1 and 222,289 in Alternative B2.

In Alternative B, 96,529 acres with high potential for the occurrence of cultural sites are managed with an NSO stipulation or as closed. These major constraints would protect areas with high potential for cultural sites by precluding development. As compared to Alternative A, Alternative B provides major constraints for 57,028 more acres with high potential for cultural sites (see Table 4-15). Therefore, Alternative B provides more protection for areas with high potential for cultural sites than compared to Alternative A.

Impacts Specific to Alternative B1 Only

Not issuing new oil and gas leases within PLAs (103,619 acres) could help to minimize adverse impacts to cultural resources found within these areas. These adverse impacts could result from concurrent oil and gas development and potash development that could occur under Alternative A. However, 43 percent of the Hatch Point PLA contains existing oil and gas leases. There is potential for concurrent development of oil and gas and potash on these existing leases and a greater likelihood for adverse impacts to cultural resources. Allowing potash leasing and development within PLAs on 103,619 acres could result in adverse impacts to cultural resources that may be found in these areas from surface and subsurface-disturbing potash related activities. If the acreage encompassed by PLAs were to become available solely for oil and gas leasing and development the adverse impacts to cultural resources would be similar to or less than the impacts identified for potash leasing and development. Alternative B1 does not allow potash leasing on 681,948 acres within the Planning Area, which would minimize adverse impacts to cultural resources from concurrent oil and gas and potash development as compared to Alternative A.

A phased approach to potash leasing could help reduce impacts to cultural resources as compared to Alternative A. By testing the feasibility of potash development, unnecessary surface disturbance would be avoided and appropriate mitigation measures applied. These measures would benefit cultural resources.

Applying a CSU stipulation to all potash leases in Alternative B1 that requires processing facilities to be located within a PPFA could damage cultural resources that may be found within those areas; however, limiting the facilities to PPFAs (42,492 acres) would help to mitigate impacts that might have been caused if the facilities were allowed anywhere within an area of 651,270 acres as described in Alternative A. About 3,037 acres of surface disturbance and the associated potential adverse impacts to cultural resources could result from the construction of potash processing facilities within the PPFAs as compared to the 4,216 acres of surface disturbance that could result from the construction of processing facilities in Alternative A. The potential adverse impacts to cultural resources associated with the construction of potash processing facilities would be less in Alternative B1 than in Alternative A.

In Alternative B1, about 228,926 acres would be open to oil and gas leasing subject to CSU and TL stipulations (minor constraints). There are zero acres managed as open to oil and gas leasing with standard terms and conditions (open). These areas managed as open to oil and gas leasing and with minor constraints that comprise about 29 percent of the Planning Area. Within these areas, projected development for oil and gas would occur. The associated surface disturbance could adversely impact cultural resources. The area managed as open and with minor constraints for oil and gas leasing and development is about 422,344 acres less than Alternative A. Therefore, there is much less likelihood for adverse impacts to cultural resources associated with oil and gas leasing and development in Alternative B1 as compared to Alternative A.

About 58 percent of the Planning Area is subject to NSO stipulations (452,269 acres) and closed to oil and gas leasing (753 acres). These major constraints would protect cultural resources within these areas by precluding development. The area covered by major constraints for oil and gas leasing and development is

about 313,723 acres more than Alternative A. Alternative B1 offers far more protection for cultural resources from impacts associated with oil and gas leasing and development than Alternative A.

In Alternative B1, about 103,619 acres would be available to potash leasing and development within the PLAs. Within the PLAs, there are about 57,620 acres managed with CSU and TL stipulations (minor constraints) and zero acres managed as open with standard terms and conditions (open). Projected potash well drilling would occur within the PLAs in the areas managed as open and with minor constraints and the associated surface disturbance could adversely impact cultural resources. The area managed as open and with minor constraints to potash leasing and development in Alternative B1 is about 593,650 acres less than Alternative A. In addition, there are about 45,999 acres within the PLAs that are subject to NSO stipulations, which would protect cultural resources by precluding surface development of potash. Therefore, adverse impacts to cultural resources associated with potash leasing and development are less likely in Alternative B1 as compared to Alternative A.

Impacts Specific to Alternative B2 Only

In Alternative B2, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would reduce impacts to cultural resources resulting from the concurrent development of oil and gas and potash as described in Alternative A. The impacts to cultural resources from the limited potash development provided in Alternative B1 would be greater than the exclusion of potash development in Alterative B2.

Alternative B2 would substitute oil and gas well drilling for potash well drilling within the PLAs established in Alternative B1 and the impacts to cultural resources would be similar. The major difference between Alternative B1 and Alternative B2 is that Alternative B2 eliminates the 3,037 acres of surface disturbance and the associated potential adverse impacts to cultural resources, which could result from the construction of potash processing facilities within the 42,492 acres of PPFAs established in Alternative B1.

Under Alternative B2, about 285,806 acres would be open to oil and gas leasing and development subject to CSU and TL stipulations. There are zero acres open to oil and gas leasing under standard terms and conditions (open). These areas managed as open to oil and gas leasing and with minor constraints (CSU and TL stipulations) comprise about 36 percent of the Planning Area. Within these areas, projected development for oil and gas would occur and the associated surface disturbance could adversely impact cultural resources. The area managed as open and with minor constraints to oil and gas leasing and development is about 365,464 acres less than Alternative A. Therefore, there is much less likelihood for adverse impacts to cultural resources associated with oil and gas development in Alternative B2 as compared to Alternative A.

About 64 percent of the Planning Area is subject to NSO stipulations (499,008 acres) and closed to oil and gas leasing (753 acres) in Alternative B2. These major constraints would protect cultural resources within these areas by precluding development. The area covered by major constraints for oil and gas leasing and development is about 360,466 acres more than Alternative A. Therefore, Alternative B2 offers far more protection for cultural resources from impacts associated with oil and gas leasing and development than Alternative A.

In Alternative B2, the entire Planning Area (785,567 acres) would be closed to potash leasing and development. Therefore, impacts to cultural resources associated with potash development are eliminated. Alternative B2 would provide far greater protection to cultural resources from surface disturbance associated with potash leasing and development than Alternatives A and B1.

4.4.5 Impacts from Alternative C

In Alternative C, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would result in the same impacts to cultural resources as those described in Alternative B2.

Impacts from applying a Lease Notice for TCPs and cultural plants would be the same as those described in Alternative B.

Impacts from applying an NSO stipulation for a one mile radius that is visible or audible from highly visited cultural sites or cultural concentration areas would be the same as Alternative B, except that a greater area would be protected. When compared with Alternative B, the number of acres would be much greater (45,289 acres in Alternative C as compared to 22,328 acres in Alternative B).

Impacts from applying a Lease Notice requiring viewshed assessment would be the same as those described in Alternative B.

Impacts from applying a Lease Notice to areas of high probability of cultural site occurrence informing the operator that it may be more difficult or costly to exercise lease rights would be the same as those described in Alternative B.

Closing the Three Rivers mineral withdrawal to mineral leasing would help protect cultural resources (including the Denis Julien inscription along the Green River) that may occur in those areas and would be the same as those described in Alternatives A and B.

Impacts from maximizing the size of oil and gas lease parcels would be the same as those described in Alternative B.

Impacts from developing BMPs as appropriate to minimize the potential resource impacts associated with mineral development would be the same as those described in Alternative B.

Impacts from applying a Baseline CSU stipulation in areas with sensitive resources in order to minimize the amount of surface disturbance and related impacts resulting from mineral development would be the same as those described in Alternative B.

For Alternative C, about 54,799 acres would be open to oil and gas leasing and development subject to CSU and TL stipulations (minor constraints). There are zero acres open to oil and gas leasing with standard terms and conditions (open). These areas managed as open to oil and gas leasing and with minor constraints comprise about 7 percent of the Planning Area. Within these areas, projected development for oil and gas would occur and the associated surface disturbance could adversely impact cultural resources. The area managed as open and with minor constraints to oil and gas leasing and development is far less than in Alternatives A, B1, and B2. As a result, adverse impacts to cultural resources associated with oil and gas surface development are much less likely in Alternative C as compared to Alternatives A, B1, and B2.

About 93 percent of the Planning Area is subject to NSO stipulations (550,599 acres) and closed to oil and gas leasing (180,169 acres). These major constraints would protect cultural resources within these areas by precluding development. The area covered by major constraints for oil and gas leasing and development is far more than Alternatives A, B1, and B2. Therefore, Alternative C offers far more protection to cultural resources from impacts associated with oil and gas leasing and development than Alternatives A, B1, and B2.

In Alternative C, 127,464 acres with high potential for the occurrence of cultural sites are managed with an NSO stipulation or as closed. These major constraints would protect areas with high potential for cultural sites by precluding development. Alternative C provides major constraints for 87,963 more acres with high potential for cultural sites than Alternative A and 30,935 more acres than Alternative B (see Table 4-15). Therefore, Alternative C provides more protection for areas with high potential for cultural sites than does Alternatives A and B.

4.4.6 Impacts from Alternative D

Impacts from applying a Lease Notice to mitigate impacts to TCPs and cultural plants from surface-disturbing activities would be the same as those described in Alternative B.

Impacts from applying an NSO stipulation up to a 0.5 mile radius that is visible or audible from highly visited cultural sites or cultural concentration areas (22,328 acres) would be the same as those described in Alternative B and greater than the impacts described in Alternative C.

Impacts from applying a Lease Notice requiring viewshed assessment would be the same as those described in Alternatives B and C.

Impacts from applying a Lease Notice to areas of high probability of cultural site occurrence informing the operator that it may be more difficult or costly to exercise lease rights would be the same as those described in Alternatives B and C.

Impacts from applying an NSO stipulation for mineral leasing within the area of the existing Three Rivers mineral withdrawal for locatable minerals (23,441 acres) would be the same as those described in Alternatives A, B, and C. This area includes the Denis Julien inscription along the Green River.

Impacts from maximizing the size of oil and gas lease parcels would be the same as those described in Alternatives B and C.

Impacts from allowing development within PLAs on 103,619 acres would be largely the same as those described in Alternative B1. However, an exception to a CSU stipulation that allows small scale potash processing facilities of 100 acres or less of surface disturbance in PLAs could adversely impact cultural resources.

Impacts from developing BMPs as appropriate to minimize the potential resource impacts associated with mineral development would be the same as those described in Alternatives B and C.

Applying the Baseline CSU stipulation in Alternative D for all mineral development on 213,218 acres, could reduce surface disturbance and potential impacts to cultural resources when compared to Alternative A. Impacts to cultural resources from applying the Baseline CSU stipulation would be very similar to Alternatives B and C. However, Alternative D provides an exception to the Baseline CSU stipulation, which could lead to more surface disturbance and potential adverse impacts to cultural resources as compared to Alternative B.

Impacts to cultural resources from applying a CSU stipulation to all potash leases that requires processing facilities to be located within a PPFA (42,492 acres) would be similar to Alternative B1; however, an exception could allow for a small-scale potash processing facility within the PLAs, allowing an additional disturbance of up to 100 acres. If the smaller potash processing facility were to be developed, the associated surface disturbance could lead to adverse impacts to cultural resources.

Under Alternative D, about 230,765 acres would be open to oil and gas leasing subject to CSU and TL stipulations (minor constraints). There are zero acres managed as open to oil and gas leasing under standard terms and conditions (open). These areas are managed as open to oil and gas leasing and with minor constraints comprising about 29 percent of the Planning Area. Within these areas, projected development for oil and gas would occur and the associated surface disturbance could adversely impact cultural resources. The area, which is managed as open and with minor constraints for oil and gas leasing and development, is about 420,505 acres less than Alternative A. Therefore, there is much less likelihood for adverse impacts to cultural resources associated with oil and gas leasing and development in Alternative D as compared to Alternative A; similar likelihood for adverse impacts as compared to Alternatives B1 and B2; and greater likelihood for adverse impacts as compared to Alternative C.

About 57 percent of the Planning Area is subject to NSO stipulations (305,899 acres) and closed to oil and gas leasing (145,284 acres). These major constraints would protect cultural resources within these areas by precluding development. The area covered by major constraints for oil and gas leasing and development is about 311,888 acres more than Alternative A; slightly less (1,839 acres) than Alternative B1; less than (48,578 acres) Alternative B2; and much less than (279,585 acres) than Alternative C. Therefore, Alternative D offers far more protection for cultural resources from impacts associated with oil and gas leasing and development than Alternative A; similar protection than Alternatives B1 and B2; and much less than Alternative C.

In Alternative D, about 103,619 acres would be available to potash leasing and development within the PLAs. Within the PLAs, there are about 57,620 acres managed with CSU and TL stipulations (minor constraints) and zero acres managed as open under standard terms and conditions (open). Projected potash well drilling would occur within the PLAs in the areas managed as open and with minor constraints and the associated surface disturbance could adversely impact cultural resources. The area managed as open and with minor constraints to potash leasing and development in Alternative D is about 593,650 acres less than Alternative A and the same as Alternative B1. Therefore, there is much less likelihood for adverse impacts to cultural resources associated with potash leasing and development in Alternative D as compared to Alternative A. In addition, out of the 103,619 acres available for potash leasing, there are about 45,999 acres that are subject to NSO stipulations, which would protect cultural resources by precluding surface development of potash leasing and development. In Alternatives B2 and C, no leasing and development of potash would occur.

In Alternative D, 95,382 acres with high potential for the occurrence of cultural sites are managed with an NSO stipulation or as closed. These major constraints would protect areas with high potential for cultural sites by precluding development. Alternative D provides major constraints for 55,881 more acres with high potential for cultural sites than Alternative A, 32,082 less acres than Alternative C, and 1,147 less acres than Alternative C (see Table 4-15). Therefore, Alternative D provides more protection for areas with high potential for cultural sites than Alternative A, less protection than Alternative C, and similar protection to Alternative B.

4.5 LANDS AND REALTY

This section presents potential impacts to lands and realty from implementing management actions presented in Chapter 2. Existing conditions concerning lands and realty management are described in Chapter 3.

4.5.1 Assumptions

- Existing locatable mineral withdrawals would continue.
- Existing designated utility right-of-way (ROW) corridors would continue.
- Filming would continue at identified filming locations.
- The BLM would grant reasonable access across BLM lands to State lands.

4.5.2 Impacts Common to All Alternatives

Applying an NSO stipulation for mineral leasing to reduce conflicts along the U.S. Highway 191 utility corridor within Moab Canyon would ensure that the corridor remains open for utilities without potential encumbrances from mineral development.

4.5.3 Impacts from Alternative A (No Action)

Applying an NSO stipulation for mineral leasing within the area of the existing Three Rivers mineral withdrawal (23,441 acres) would ensure that these major river corridors are protected from the impacts associated with the development of leasable mineral resources. These impacts are identical in Alternatives A, B and D; Alternative C provides additional protection for the river corridors.

Allowing mineral industry traffic on the Needles Overlook and Anticline Overlook Roads could lead to heavy truck traffic along State scenic backways, which could degrade the road surface and create poor road conditions.

No leasing stipulation would be applied to protect filming sites. Therefore, mineral leasing and development could adversely affect the viewshed from popular filming locations by placing infrastructure in generally undeveloped landscapes.

4.5.4 Impacts from Alternative B

Impacts from applying an NSO stipulation for mineral leasing within the area of the existing Three Rivers mineral withdrawal (23,441 acres) would be the same as those described in Alternative A.

Applying a CSU stipulation precluding the use of heavy trucks on the Needles Overlook and Anticline Overlook Roads would prevent impacts to the road surface. However, utilizing an exception to this CSU stipulation when there are no alternative routes available could lead to heavy truck traffic and damage to the roads, but the exception would require bonding, which would ensure that the damage to these roads would be repaired.

Applying a CSU stipulation within 1.0 mile of the high use filming locations (177,594 acres) would help to protect these locations from activities that could discourage filming. This stipulation would require a visual assessment to demonstrate that the proposed mineral operations within this area do not result in long term impairment to the scenic quality from the filming location.

Impacts Specific to Alternative B1 Only

There are no specific impacts from Alternative B1 to the Lands and Realty program.

Impacts Specific to Alternative B2 Only

There are no specific impacts from Alternative B2 to the Lands and Realty program.

4.5.5 Impacts from Alternative C

Closing the Three Rivers mineral withdrawal to mineral leasing (23,441 acres) would ensure that these major river corridors are protected from mineral leasing and development because adjacent development would be further reduced when compared to applying an NSO stipulation.

Applying a CSU stipulation precluding the use of heavy trucks on the Needles Overlook and Anticline Overlook Roads would prevent impacts to the road surface.

Applying an NSO stipulation within 1.0 mile of the high use filming locations (177,594 acres) would provide greater protection to these locations from mineral activities that could discourage filming than Alternative B.

4.5.6 Impacts from Alternative D

Impacts from applying an NSO stipulation for mineral leasing within the area of the existing Three Rivers mineral withdrawal (23,441 acres) would be the same as those described in Alternative A.

Impacts of applying a CSU stipulation precluding the use of heavy trucks on the Needles Overlook and Anticline Overlook Roads would be the same as those described in Alternative B.

Impacts from applying a CSU stipulation within 1.0 mile of the high use filming locations would be the same as those described in Alternative B.

4.6 LANDS WITH WILDERNESS CHARACTERISTICS

This section presents potential impacts to lands with wilderness characteristics from implementing management actions presented in Chapter 2. Existing conditions concerning lands with wilderness characteristics are described in Chapter 3.

4.6.1 Assumptions

- The BLM would continue to manage natural areas to protect their wilderness characteristics. The BLM would implement authorizations associated with this MLP/FEIS in a manner that minimizes impacts to lands with wilderness characteristics.

- Impacts to lands with wilderness characteristics include those that affect the size, naturalness, solitude, or primitive recreation opportunities within inventoried lands with wilderness characteristics.

4.6.2 Impacts from Alternative A (No Action)

In Alternative A, oil and gas and potash leasing and development could occur concurrently with the same tract of land, which could result in higher concentrations of development and redundant infrastructure. Although drilling for oil and gas and potash is similar, the production of potash requires the use of potash processing facilities, which involve large tracts of land over a long period of time. Mineral development would result in soil and vegetation disturbance and the presence of permanent structures that would degrade the naturalness of lands with wilderness characteristics. The noise of construction and operation of mineral facilities, including the presence of work crews, vehicles, and equipment, would degrade opportunities for solitude and conflict with primitive recreational opportunities.

A total of 265,246 acres within the Planning Area have been identified as possessing wilderness characteristics. Within the 265,246 acres of lands with wilderness characteristics, 41,102 acres are managed as open with standard terms and conditions (open) and 172,166 acres are managed with CSU or TL stipulations (minor constraints). The projected mineral development on these acres managed as open and with minor constraints could lead to the loss of naturalness, opportunities for primitive and unconfined recreation, and solitude. Oil and gas and potash leasing could lead to the development of roads and facilities and increase traffic, noise, and dust that would diminish wilderness characteristics. Lands managed as open or with minor constraints (CSU and TL stipulations) on lands with wilderness characteristics could also lose the minimum size criteria (of 5,000 acres) required to be considered as containing wilderness characteristics.

Managing 51,024 acres of lands with wilderness characteristics by applying an NSO stipulation and 753 acres as closed to mineral leasing would preclude development, which would preserve naturalness, opportunities for primitive and unconfined recreation, and solitude. This would benefit lands identified as having wilderness characteristics.

Potash leasing and development would have similar impacts on lands with wilderness characteristics, except that wells could be more tightly spaced and areas that have both oil and gas and potash resource development could have more surface disturbance, which could lead to further loss of opportunities for primitive and unconfined recreation and solitude.

Not having BMPs to protect night skies could result in mineral development with associated light pollution. The resulting light pollution could reduce the naturalness and opportunities for primitive recreation within lands with wilderness characteristics by obscuring night time views of the stars. Not having specific BMPs

to reduce noise and protect soundscapes could reduce the naturalness and feeling of solitude within the Planning Area.

4.6.3 Impacts from Alternative B

Maximizing the size of oil and gas lease parcels could reduce the number of operators and thereby reduce oil and gas infrastructure, which could ultimately reduce adverse impacts to opportunities for primitive and unconfined recreation and solitude when compared to Alternative A.

The use of BMPs outlined in Appendix B could reduce the effects of mineral leasing and development on lands with wilderness characteristics by limiting facility visibility and noise, reducing traffic, and limiting other mineral related impacts, as compared with Alternative A, to lands with wilderness characteristics, such as naturalness, opportunities for primitive and unconfined recreation, and solitude.

BMPs to reduce night sky impacts would provide a more ideal setting for opportunities for primitive and unconfined recreation. BMPs to mitigate mineral operation noise would decrease mineral operation impacts, as compared with Alternative A, to the background setting, which would protect opportunities for primitive and unconfined recreation and solitude.

A total of 265,246 acres within the Planning Area have been identified as possessing wilderness characteristics. However, the Baseline CSU stipulation would be applied only to the 192,220 acres of lands with wilderness characteristics analyzed in the 2008 Resource Management Plans (RMP). This could reduce the number of well pads and roads, space well pads further apart, limit redundant infrastructure, increase reclamation activities, and reduce overall surface disturbance as compared to Alternative A. These actions could reduce the impacts from mineral leasing and development on naturalness, opportunities for primitive and unconfined recreation, and solitude within the 192,220 acres.

Impacts Specific to Alternative B1 Only

Not issuing new oil and gas leases within PLAs (103,619 acres) could help to minimize adverse impacts to 29,769 acres of lands with wilderness characteristics found within PLAs. These adverse impacts could result from the concurrent oil and gas development and potash development, which could occur under Alternative A. However, 43 percent of the Hatch Point PLA contains existing oil and gas leases. Therefore, there is potential for concurrent development of oil and gas and potash on these existing leases and a greater likelihood for adverse impacts to 17,871 acres of lands with wilderness characteristics in the Hatch Point PLA. The development of potash leases in the PLAs could reduce naturalness and opportunities for primitive recreation and solitude for the next 15 years. Furthermore, if potash resources do not develop in that time frame, the area could again be available for oil and gas leasing. If the acreage encompassed by PLAs were to become available solely for oil and gas leasing and development, the adverse impacts to lands with wilderness characteristics would be similar to or less than the impacts identified for potash leasing and development. Alternative B1 does not allow potash leasing on 681,948 acres within the Planning Area, which would minimize adverse impacts to lands with wilderness characteristics from concurrent oil and gas and potash development as compared to Alternative A.

A phased approach to potash leasing could help reduce impacts to lands with wilderness characteristics as compared to Alternative A. By testing the feasibility of potash development, unnecessary surface disturbance would be avoided and appropriate mitigation measures applied. These measures would benefit lands with wilderness characteristics.

The Red Wash and Hatch Point PLAs overlap lands with wilderness characteristics, which could lead to potash development that could result in the loss of naturalness, opportunities for primitive and unconfined

recreation, and solitude in these areas. As compared to Alternative A, fewer lands with wilderness characteristics are available for potash leasing and development.

No lands with wilderness characteristics exist in areas identified as PPFAs. Therefore, there would be no adverse impacts to lands with wilderness characteristics resulting from the establishment of PPFAs.

Under Alternative B1, about 265,246 acres are identified as having wilderness characteristics. Of this acreage, 31,914 would be open to oil and gas leasing subject to CSU and TL stipulations (minor constraints). There are zero acres open to oil and gas leasing under standard terms and conditions (open). Within these 31,914 acres, projected development for oil and gas would occur and the associated surface disturbance could adversely impact lands with wilderness characteristics. The lands with wilderness characteristics that are managed as open and with minor constraints for oil and gas leasing and development is about 140,252 acres less than Alternative A. Therefore, there is much less likelihood for adverse impacts to lands with wilderness characteristics associated with oil and gas leasing and development in Alternative B1 as compared to Alternative A. About 76 percent of the lands with wilderness characteristics in Alternative B1 are subject to NSO stipulations (202,810 acres) and closed to oil and gas leasing (753 acres). These major constraints would protect lands with wilderness characteristics by precluding development. The area covered by major constraints for oil and gas leasing and development is about 169,786 acres more than Alternative A. Therefore, Alternative B1 offers far more protection for lands with wilderness characteristics from impacts associated with oil and gas leasing and development than Alternative A.

Under Alternative B1, about 103,619 acres would be available to potash leasing and development within the PLAs. Within the PLAs, there are about 29,769 acres of lands with wilderness characteristics that are available for potash leasing and development. Of these acres, 7,020 are subject to CSU and TL stipulations and 22,749 are subject to NSO stipulations. Projected potash well drilling within the 7,020 acres subject to CSU and TL stipulations and the associated surface disturbance could adversely impact lands with wilderness characteristics. The lands with wilderness characteristics where surface development of potash development is projected to occur is about 206,248 acres less than Alternative A. Therefore, there is much less likelihood for adverse impacts to lands with wilderness characteristics associated with potash leasing and development in Alternative B1 as compared to Alternative A.

Impacts Specific to Alternative B2 Only

In Alternative B2, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would reduce impacts to lands with wilderness characteristics that would result from the concurrent development of oil and gas and potash as described in Alternative A. The impacts to lands with wilderness characteristics from the limited potash development provided in Alternative B1 would be greater than the exclusion of potash development in Alterative B2.

Alternative B2 would substitute oil and gas well drilling for potash well drilling within the PLAs established in Alternative B1 and the impacts to wilderness characteristics would be similar. The major difference between Alternative B1 and Alternative B2 is that Alternative B2 eliminates the 3,037 acres of surface disturbance, as well as the associated potential adverse impacts to wilderness characteristics, which could result from the construction of potash processing facilities within the 42,492 acres of PPFAs established in Alternative B1.

Under Alternative B2, about 265,246 acres are identified as having wilderness characteristics. Of this acreage, 38,934 would be open to oil and gas leasing subject to CSU and TL stipulations (minor constraints). There are zero acres managed as open to oil and gas leasing with standard terms and conditions (open). Within these 38,934 acres, projected development for oil and gas would occur and the associated surface

disturbance could adversely impact lands with wilderness characteristics. The lands with wilderness characteristics managed as open and with minor constraints for oil and gas leasing and development is about 174,334 acres less than Alternative A and similar to Alternative B1. Therefore, there is much less likelihood for adverse impacts to lands with wilderness characteristics associated with oil and gas development in Alternatives B1 and B2 as compared to Alternative A. About 85 percent of the lands with wilderness characteristics in Alternative B2 are subject to NSO stipulations (225,259 acres) and are closed to oil and gas leasing (753 acres). These major constraints would protect lands with wilderness characteristics by precluding surface development. The area covered by major constraints for oil and gas leasing and development is about 173,565 acres more than Alternative A and similar to Alternative B1. Therefore, Alternatives B1 and B2 offer far more protection for lands with wilderness characteristics from impacts associated with oil and gas leasing and development than Alternative A.

4.6.4 Impacts from Alternative C

In Alternative C, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would result in the same impacts to lands with wilderness characteristics as those described in Alternative B2.

Maximizing the size of oil and gas lease parcels would have the same impact as Alternative B.

The use of BMPs outlined in Appendix B to reduce the effect of mineral leasing and development would have the same impact as Alternative B.

A CSU stipulation to reduce impacts to night skies would protect the naturalness of dark skies more than the BMPs applied under Alternative B. Impacts from BMPs to mitigate noise on lands with wilderness characteristics would be similar to Alternative B; however, by further applying a CSU stipulation that requires measurable noise limits would ensure more effective auditory mitigation as it pertains to opportunities for primitive and unconfined recreation and solitude.

Impacts from applying the Baseline CSU stipulation on lands with wilderness characteristics would be similar to Alternative B, except there would be 73,026 more acres of lands included in the stipulation for a total of 265,246 acres.

Under Alternative C, about 265,246 acres are identified as having wilderness characteristics. Of this acreage 9,021 would be managed as open to oil and gas leasing subject to CSU and TL stipulations (minor constraints). There are zero acres open to oil and gas leasing with standard terms and conditions (open). Within the 9,021 acres that are managed as open and with minor constraints, projected development for oil and gas would occur and the associated surface disturbance could adversely impact lands with wilderness characteristics. The lands with wilderness characteristics managed as open and with minor constraints for mineral leasing and development are about 204,247 acres less than Alternative A, about 29,913 acres less than Alternatives B1 and B2. Therefore, there is less likelihood for adverse impacts to lands with wilderness characteristics associated with oil and gas leasing and development in Alternative C as compared to Alternatives A, B1, and B2. About 97 percent of the lands with wilderness characteristics in Alternative C are subject to NSO stipulations (148,266 acres) and closed to oil and gas leasing (107,959 acres). These major constraints would protect lands with wilderness characteristics by precluding surface development. The area covered by major constraints for oil and gas leasing and development is about 204,448 acres more than Alternative A, 30,933 acres more than Alternatives B1 and B2. Therefore, Alternative C offers more protection for lands with wilderness characteristics from impacts associated with oil and gas leasing and development than Alternatives A, B1, and B2.

4.6.5 Impacts from Alternative D

Maximizing the size of oil and gas lease parcels would have the same impact as Alternatives B and C.

The use of BMPs outlined in Appendix B to reduce the effects of mineral leasing and development would have the same impact as under Alternatives B and C.

Impacts from BMPs to protect night skies would be the same as under Alternative B. The CSU stipulation to protect night skies in Alternative C would protect the naturalness of dark night skies more than the BMPs included in Alternative D. The impact of the BMPs and the CSU stipulation to mitigate noise as it pertains to opportunities for primitive and unconfined recreation and solitude would be the same as that described for Alternative C.

Impacts from applying a Baseline CSU would be similar to Alternative B, although an exception could be granted (Appendix A), which could increase the density of well spacing in some instances. This additional drilling could result in an increased loss of naturalness, opportunities for primitive and unconfined recreation, and solitude compared with Alternative B. However, impacts would be less than Alternative A and more than Alternatives B and C where the exception does not apply.

Designating PLAs would have the same impacts as those described in Alternative B1.

Considering phased leasing would have the same impacts as those described in Alternative B1.

Under Alternative D, about 265,246 acres are identified as having wilderness characteristics. Of this acreage, 32,464 would be managed as open to oil and gas leasing subject to CSU and TL stipulations (minor constraints). There are zero acres managed as open to oil and gas leasing under standard terms and conditions (open). Within the 32,464 acres that are managed as open and with minor constraints, projected development for oil and gas would occur and the associated surface disturbance could adversely impact lands with wilderness characteristics. The lands with wilderness characteristics managed as open and with minor constraints for oil and gas leasing and development is about 190,804 acres less than Alternative A, about 550 acres more than Alternative B1, about 6,470 acres less than Alternative B2, and about 23,443 acres more than Alternative C. Therefore, there is much less likelihood for adverse impacts to lands with wilderness characteristics associated with oil and gas leasing and development in Alternative D as compared to Alternative A, similar potential for adverse impacts as compared to Alternatives B1 and B2, and more potential for adverse impacts as compared to Alternative C. About 77 percent of the lands with wilderness characteristics in Alternative D are subject to NSO stipulations (111,230 acres) and closed to oil and gas leasing (91,783 acres). These major constraints would protect lands with wilderness characteristics by precluding development. The area covered by major constraints for oil and gas leasing and development is about 151,236 acres more than Alternative A, about 550 acres less than Alternative B1, about 23,199 less than Alternative B2, and about 43,212 less than Alternative C. Therefore, Alternative D offers far more protection for lands with wilderness characteristics from impacts associated with oil and gas leasing and development than Alternative A, similar protection as compared to Alternative B1, and less protection as compared to Alternatives B2 and C.

For potash leasing and development under Alternative D, the impacts to lands with wilderness characteristics would be similar to those described in Alternative B1. However, Alternative D provides exceptions to leasing stipulations that allow for closer drill spacing and small-scale potash processing facilities within PLAs, which could overlap some areas with wilderness characteristics. Therefore, these exceptions could result in greater adverse impacts to lands with wilderness characteristics than those described for Alternative B1.

4.7 LIVESTOCK GRAZING

This section presents potential impacts to livestock grazing management from implementing management actions presented in Chapter 2. Existing conditions concerning livestock grazing management are described in Chapter 3.

4.7.1 Assumptions

- Livestock grazing would occur throughout the majority of the Planning Area.
- Potash processing facilities involve the large scale construction of permanent facilities and the loss of vegetation and associated AUMs for livestock grazing. The drilling of oil and gas and potash wells would involve temporary and minimal loss of vegetation and an inconsequential loss of AUMs.

4.7.2 Impacts from Alternative A (No Action)

Under Alternative A, construction of potash processing facilities could occur anywhere within 210,884 acres that are open with standard terms and conditions (open) and 443,056 acres managed with CSU and TL stipulations (minor constraints). Construction of solar evaporation potash processing facilities in these areas could permanently occupy up to 3,716 acres and remove up to 198 AUMs. In addition, construction of a crystallization potash processing facility could occupy up to 500 acres and remove up to 26 AUMs.

4.7.3 Impacts from Alternative B

Impacts Specific to Alternative B1 Only

Applying a CSU stipulation to all potash leases that requires potash processing facilities to be located within a PPFA (42,492 acres) would localize the disturbance and infrastructure to the PPFAs and prevent large-scale disturbance from potash processing in other areas in the Planning Area that could occur under Alternative A. Limiting the area available for PPFAs would reduce loss of forage outside of those areas from potash processing and help retain AUMs available for livestock. The estimated amount of acreage that could be disturbed by PPFAs is 3,037 acres, which could result in the loss of 59 AUMs that would no longer be available to livestock under this alternative. The loss of AUMs within the PPFAs would be much less than that projected for Alternative A.

Impacts Specific to Alternative B2 Only

Under Alternative B2, there would be no land available for potash development. Therefore, no AUMs would be removed due to potash development.

4.7.4 Impacts from Alternative C

Under Alternative B2, there would be no land available for potash development. Therefore, no AUMs would be removed due to potash development.

4.7.5 Impacts from Alternative D

Impacts to livestock grazing resulting from potash processing facilities would be the same as Alternative B1.

4.8 MINERALS

4.8.1 Oil and Gas

This section presents potential impacts to oil and gas leasing from implementing management actions presented in Chapter 2. Existing conditions concerning oil and gas management are described in Chapter 3.

Assumptions

- Oil and gas leasing, exploration, and development would continue to occur in the Planning Area during the planning period.
- Leaseholders have the right to explore, develop, and produce oil and gas resources from any valid, existing lease, even if the area containing the lease were proposed to be closed to future leasing.
- A valid, existing oil and gas lease is a legal contract secured by a leaseholder before the effective date of the Planning Area Notice of Intent for the MLP process.
- The resource protection measures identified in the Moab MLP will also apply to areas currently under lease where they do not conflict with the rights granted to the holder of the lease. While the BLM may not unilaterally add a new stipulation to an existing lease that it has already issued, the BLM can subject the development of existing leases to reasonable measures in order to minimize impacts to other resource values. These reasonable measures would be applied as Conditions of Approval to post lease actions (e.g. permits to drill) and may include, but are not limited to, modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures.
- Directional and/or horizontal drilling could be used to access hydrocarbon resources under areas constrained by surface use restrictions (e.g., NSO restrictions).
- Directional and/or horizontal drilling viability and offset distance varies with the target formation, the top depth of the target formation, and formation productivity.
- Based on past BLM drilling experience, plugging and closure procedures have been shown to be effective in protecting groundwater resources.
- Disturbed areas would be successfully reclaimed within a scope of 10 years.
- Based on recent drilling success rates for horizontal wells drilled within the Planning Area, it is assumed that 60 percent of the wells will be productive and 40 percent will be dry holes, which would be abandoned and successfully reclaimed within a 10 year period. It is also assumed that there would be an average of 4 well bores per well pad.
- Geophysical exploration would beneficially impact oil and gas development by providing data necessary for prudent placement of well pads resulting in potentially higher success rates and less total drilling. Surface disturbance associated with geophysical exploration would be short-term and successfully reclaimed within 3 years.
- Mitigation and revegetation would be successful within a scope of 10 years.

- The projection for future oil and gas development and the associated surface disturbance is displayed in Table 4-16.

Table 4-16. Projected Oil and Gas Development and Surface Disturbance on Bureau of Land Management Lands (over next 15 years)

Action	Alternative A	Alternative B1	Alternative B2	Alternative C	Alternative D
Well pads[1] (number of pads)	58	38	47	9	42
Gross surface disturbance (acres disturbed)	476	312	385	74	344
Net surface disturbance after reclamation (acres disturbed)	343	225	277	53	248

[1] It is assumed that there would be an average of 4 well bores per well pad.

Predicted surface disturbance for oil and gas development by alternative on BLM lands was calculated by multiplying the percent of BLM lands open for development under each of the alternatives by the total number of well pads predicted for all lands within the RFD. Lands designated with an NSO stipulation or as closed to leasing were not considered open. However, where NSO lands have an exception for the stipulation, an allowance was made for a limited number of well pads. Similarly, where a CSU stipulation is based on achieving the objectives of VRM Class II, an allowance was made for a limited number of well pads.

Impacts Common to All Alternatives

The economic costs of applying lease stipulations by alternative are found in the socioeconomic section.

Meeting National Air Quality Standards could result in additional emission control requirements that could result in delays and extra costs for oil and gas operations on Federal lands.

Requiring that project specific analysis require the use of quantitative air quality analysis methods (i.e., modeling), when appropriate, would result in potential delays and additional costs.

Applying an NSO stipulation to the U.S. 191 utility corridor would require the use of more costly directional and horizontal drilling to access the underlying Federal oil and gas resources.

Applying lease stipulations on lands with split-estate could restrict and delay oil and gas development on Federal minerals with non-Federal surface.

Applying an NSO stipulation to lands managed as Natural Areas would require the use of more costly directional and horizontal drilling to access the underlying Federal oil and gas resources.

Applying an NSO stipulation to areas with incompatible surface use (Moab Landfill, Moab Airport, and Dead Horse Point State Park) would require the use of more costly directional and horizontal drilling to access the underlying Federal oil and gas resources.

Applying Lease Notices for complying with mitigation requirements for raptors, migratory birds, and species included in both the Threatened and Endangered Species Act (ESA) and the Special Status Species list could result in delays and additional costs to oil and gas operations.

Timing limitations for wildlife and special status species do not substantially vary across alternatives. Timing limitations vary by species, and overlapping timing limitations can occur on some acreage. The greater the overlap of timing restrictions for different species, the greater the potential cost to oil and gas operator as discussed in the paragraph above. For example, an operator who proposed a project in the overlap area between deer winter range and spring fawning (an area of 515 acres within the MLP) would face additional timing limitations and could thus incur extra cost because of the restraints.

ESA species, including bald and golden eagles, raptors, and migratory birds are all afforded some level of Federal protection. These protective measures are required by the U.S. Fish and Wildlife Service (USFWS) under various laws. The seasonal and spatial restrictions found in the MLP/FEIS for these species have been developed by the USFWS and are consistent throughout the State of Utah. Adherence to these conditions is required to comply with the ESA and various laws protecting eagles, raptors, and migratory birds. Currently, much of the known habitats and occupancy for several of ESA species is known, therefore reducing some of the need for surveys to evaluate habitats. ESA species are very rare and the Moab Field Office has had minimal need to adjust or project timing or locations to accommodate the presence of an individual ESA species.

Additionally, surveys for ESA species, bald and golden eagles, and raptors may be required no matter when the activity is planned. All permanent facilities or projects that create long term habitat alteration would require nesting surveys for ESA species, bald and golden eagles, and raptors during the breeding season prior to project finalization. These surveys are incorporated into the site-specific project NEPA analysis and if needed, USFWS consultation. These requirements and needs are not new to the MLP and have been in place even prior to the 2008 RMP. The results of these surveys may influence project development. If there is no suitable nesting structure within the USFWS recommended spatial buffers of a project area, surveys may not be needed.

Sensitive raptors species are afforded the same timing and spatial requirement as all other raptors, as recommended by the USFWS. For kit fox and prairie dogs, the stipulations are the same as the 2008 RMP. Their habitats typically do not overlap with big game winter range but may coincide with pronghorn fawning and bighorn lambing areas.

The kit fox, a sensitive species, does have seasonal restrictions specific to occupied natal dens, which may be waived if surveys indicate kit fox with their pups are not present. Current modeling efforts are in place that can help to refine where the kit fox may occur and often project onsites can determine the need for surveys. Kit fox are fairly uncommon throughout the Moab Field Office and finding a natal den is very rare; therefore, the need has been minimal to adjust project timing to accommodate the presence of a kit fox with their pups.

In regards to the timing overlap question (assuming raptor surveys needs have been met), there would be no seasonal wildlife TL stipulations in areas outside of deer and elk winter ranges (29,700 acres) and bighorn lambing/rutting areas (107,000 acres). If a project were in kit fox habitat and/or fawning areas for pronghorn, no activity could be allowed from March 1 to July 31 within 85,639 acres. If surveys were performed and indicated no natal kit fox dens were within 200 meters of the project, then the project would be limited only to activities outside of April 1 to July 31 to protect pronghorn fawning and migratory bird nesting. In this site-specific situation, 'worst case' would still allow a construction window of seven months, from August 1 through February 28. If raptors had been identified, project location or other

mitigation measures would be applied, typically not timing restrictions unless the project or portions of the project created temporary disturbances within the spatial buffer of the raptor nest.

In deer and elk winter range (29,700 acres), there is minimal kit fox habitat and/or fawning areas for pronghorn, so other wildlife timing limitations would not be expected. In deer and elk winter range 'worst case' would still allow a window of seven months, April 16 through November 15. If raptors had been identified, project location or other mitigation measures would be applied, rather than timing restrictions unless the projects were temporary. If the project were temporary and raptors did occur in the area or raptor surveys were determined to be not necessary, the work window might then be limited to September 1 to November 15. If a temporary action had been started prior to the onset of the winter season, Utah Department of Wildlife Resources (UDWR) will usually allow for some short term encroachment into the winter season.

Activities in desert bighorn lambing/rutting habitat (107,000 acres) are limited to temporary actions through a CSU stipulation. In the "worst case," if raptors occurred in the area or surveys were not performed and the temporary action is determined to impact desert bighorn, work would be allowed from December 15 to March 1.

Timing limitations for ESA species are not required unless there is a known individual in the area, or surveys are not current and therefore occupancy status is not known. The entire Moab MLP area has been evaluated for both Mexican spotted owl (MSO) and Southwestern willow flycatcher (SWFL). Within the MLP area, there are approximately 116,300 acres of suitable MSO habitats of which over 70,000 acres are typically surveyed by the BLM and would not need additional project specific surveys. Only 2,800 acres of suitable (but unoccupied) MSO habitats are found in deer winter range; therefore, additional timing limitation requirements would not be expected. These 2,800 acres are routinely surveyed by the BLM.

SWFL and yellow-billed cuckoo (YBCU) timing stipulations coincide with other timing limitations outside of deer and elk winter range areas. There are only 92 acres of SWFL/YBCU habitats that overlap with winter ranges and these areas are not known to be occupied; therefore, additional SWFL and YBCU timing limitations would not be expected. It should be pointed out that both SWFL and YBCU occupy riparian habitat, which is managed with a NSO stipulation to protect riparian resources.

Though these seasonal restrictions can seem cumbersome, upfront work between the BLM and applicants early in the development stage of these projects can simplify survey needs and ensure there is an ample window of time to complete projects or develop project plans, ensuring Federal Acts are not violated, and impacts to protected and State sensitive species and big game are minimized. Accurate surveys completed at the correct time will help to avoid delays, facilitate project planning, and allow accurate environmental analysis that is less likely to be litigated, thus allowing the project to move forward in a timely fashion.

The Moab BLM does recognize that many of the timing limitation stipulations can overlap, possibly creating additional constraints. However, not all habitats that have these seasonal stipulations are located in the same place. As mentioned above, winter ranges for deer and elk overlap very little with pronghorn, deer and elk spring fawning areas. ESA species such as the SWFL and YBCU are very specific to small, highly vegetated riparian areas that typically are located within areas with watershed stipulations that will coincide with ESA requirements. The MSO does have the largest potential habitat for an ESA species in the Planning Area and may need site specific surveys, but habitat evaluation throughout the Planning Area has been completed and many areas are maintained under protocol survey, therefore reducing the scope of survey needs by outside parties.

Applying a TL stipulation for the Lockhart Basin desert bighorn sheep herd could result in delays and additional cost to oil and gas operations.

Impacts from Alternative A (No Action)

Under Alternative A, oil and gas leasing could occur on 210,884 acres subject to standard terms and conditions (open), which would provide the most flexibility for oil and gas exploration and development. Oil and gas operations conducted in open areas generally impose the least cost to operators.

There are about 440,386 acres managed with CSU and TL stipulations in Alternative A. These stipulations may result in additional costs and delays to oil and gas operators by limiting the siting of operations and requiring specialized equipment, design considerations, and erosion control plans. TL stipulations would result in additional costs and delays by requiring surveys, avoidance of occupied areas, rerouting of roads and pipelines, and re-siting of oil and gas facilities, or extra operational time if the surface disturbance window does not accommodate an individual project schedule and timeline and project activities need to be postponed.

In Alternative A, 133,574 acres would be managed with an NSO stipulation. NSO stipulations could increase the complexity of oil and gas operations and slow down production. Development in NSO areas would require the use of more costly methods, such as directional and horizontal drilling, to access oil and gas resources. NSO stipulations would preclude the use of the surface for the development of oil and gas, but would still allow the recovery of these resources at a greater cost. Precluding surface disturbance in areas with NSO stipulations would decrease the number of wells drilled during the planning period.

The closure of 753 acres to oil and gas leasing in Alternative A would eliminate opportunities to develop oil and gas resources in those areas.

The projection for oil and gas development for this alternative is 58 well pads and 232 wells.

Applying BMPs to all oil and gas authorizations, in accordance with WO IM 2007-021 and the "*Gold Book*," could delay oil and gas development or affect the location and timing of development. BMPs for health and safety along U.S. 191 and I-70, saline soils, and water quality could delay oil and gas development or affect the location and timing of development in these areas. The use of BMPs could increase the complexity and time involved in developing oil and gas and could lead to increased costs.

Impacts from Alternative B

Oil and gas leasing decisions are discussed separately in Alternatives B1 and B2.

Impacts Specific to Alternative B1 Only

Designating PLAs (103,619 acres) and restricting new oil and gas leasing for the long term in these areas would reduce the total area available for oil and gas leasing in the Planning Area, which would reduce the amount of oil and gas drilling and potential production.

Under Alternative B1, oil and gas leasing would occur on zero acres subject to standard terms and conditions (open). This would mean open acreage, which generally is the least costly to develop, would not be available. This is less open acreage than Alternative A.

There are about 228,926 acres managed with CSU and TL stipulations in Alternative B1. The impacts of the CSU stipulations in Alternative B1 are similar to those described in Alternative A, but apply to more resources. The CSU stipulations applied in Alternative B1 may result in additional costs and delays to oil and gas operators as compared to the CSU stipulations applied in Alternative A. The TL stipulations applied in Alternative B1 are similar to those applied in Alternative A and would result in similar impacts.

While Alternative B1 applies CSU and TL stipulations to 211,430 fewer acres than Alternative A, these acres are managed more restrictively (NSO and closed) in Alternative B1.

Of the 228,926 acres managed with CSU and TL stipulations stated above, Alternative B1 would impose the Baseline CSU stipulation on 208,185 acres. The application of the Baseline CSU stipulation could reduce or delay the production of oil and gas and increase the complexity of operations. Restricting well pads to no closer than two miles apart could reduce the effectiveness of extracting oil and gas in some areas. The collocation of facilities could increase the complexity of operations. Requiring extensive interim reclamation and offsite mitigation could increase costs to oil and gas operators.

In Alternative B1, 452,269 acres would be managed with NSO stipulations. About 318,705 more acres are managed with an NSO stipulation in Alternative B1 than in Alternative A. NSO stipulations could increase the complexity of mineral operations and slow down production. Development in NSO areas would require the use of more costly methods, such as directional and horizontal drilling, to access oil and gas resources. NSO stipulations would preclude the use of the surface for the development of oil and gas, but would still allow the recovery of these resources at a greater cost. Precluding surface disturbance in areas with NSO stipulations would decrease the number of wells drilled during the planning period.

The closure of 753 acres to oil and gas leasing in Alternative B1 would result in the same impacts as those described in Alternative A.

Applying BMPs to oil and gas authorizations could delay oil and gas development or affect the location and timing of development in these areas. The use of BMPs could increase the complexity and time involved in developing oil and gas and could lead to increased costs. In Alternative B1, BMPs are applied to more resources than in Alternative A and would result in greater impacts to oil and gas development.

Applying Lease Notices for additional resources in Alternative B1 would result in more delays and additional costs to oil and gas operations than those resulting from the Lease Notices applied to all alternatives.

The projection for oil and gas development in Alternative B1 is 38 well pads and 152 wells. This represents 80 fewer wells than projected in Alternative A. Drilling fewer wells could result in less domestic supply of oil and gas and fewer royalties to Federal, State, and local governments.

Impacts Specific to Alternative B2 Only

Under Alternative B2, the Planning Area would be managed only for oil and gas leasing.

Under Alternative B2, oil and gas leasing would occur on zero acres subject to standard terms and conditions (open). This would mean open acreage, which is generally the least costly to develop, would not be available. This also would mean less open acreage than Alternative A and the same as Alternative B1.

There are about 285,806 acres managed with CSU and TL stipulations in Alternative B2, which is similar to Alternative B1. The impacts of the CSU stipulations in Alternative B2 are similar to those described in Alternative A, but apply to more resources. The CSU stipulations applied in Alternative B2 may result in additional costs and delays to oil and gas operators as compared to the CSU stipulations applied in Alternative A. The TL stipulations applied in Alternative B2 are similar to those applied in Alternative A and would result in similar impacts. While Alternative B2 applies CSU and TL stipulations to 154,550 fewer acres than Alternative A, these acres are managed more restrictively (NSO and closed) in Alternative B2.

Of the 285,806 acres managed with CSU and TL stipulations stated above, Alternative B2 would impose the Baseline CSU stipulation on 222,289 acres. The application of the Baseline CSU stipulation in Alternative B2 would have similar impacts to oil and gas development as those described in Alternative B1.

In Alternative B2, 499,008 acres would be managed with NSO stipulations, which is similar to Alternative B1. About 365,434 more acres are managed with an NSO stipulation in Alternative B2 than in Alternative A. NSO stipulations could increase the complexity of oil and gas operations and slow down production. Development in NSO areas would require the use of more costly methods, such as directional and horizontal drilling, to access oil and gas resources. NSO stipulations would preclude the use of the surface for the development of oil and gas, but would still allow the recovery of these resources at a greater cost. Precluding surface disturbance in areas with NSO stipulations would decrease the number of wells drilled during the planning period.

The closure of 753 acres to oil and gas leasing in Alternative B2 would result in the same impacts as those described in Alternatives A and B1.

Applying BMPs to oil and gas authorizations in Alternative B2 would have the same impacts to oil and gas development as those described in Alternative B1.

Applying Lease Notices for additional resources in Alternative B2 would have the same impacts to oil and gas development as those described in Alternative B1.

The projection for oil and gas development in Alternative B2 is 47 well pads and 188 wells. This represents 44 fewer wells than projected in Alternative A and 36 more wells than projected in Alternative B1. Drilling fewer wells could result in less domestic supply of oil and gas and fewer royalties to Federal, State, and local governments.

Impacts from Alternative C

Under Alternative C, the Planning Area would be managed only for oil and gas leasing.

Under Alternative C, oil and gas leasing would occur on zero acres subject to standard terms and conditions (open). This would mean open acreage, which generally is the least costly to develop, would not be available. This is less open acreage than Alternative A and the same as Alternatives B1 and B2.

There are about 54,799 acres managed with CSU and TL stipulations in Alternative C. The impacts of the CSU stipulations in Alternative C are similar to those described in Alternative A but, as seen with Alternatives B1 and B2, apply to more resources. The CSU stipulations applied in Alternative C may result in additional costs and delays to oil and gas operators as compared to the CSU stipulations applied in Alternative A. The TL stipulations applied in Alternative C are similar to those applied in Alternative A and would result in similar impacts. Alternative C applies CSU and TL stipulations to 385,557 fewer acres than Alternative A, 174,127 fewer acres than Alternative B1 and 231,007 fewer acres than Alternative B2. However, these acres are managed more restrictively (NSO and closed) in Alternative C than in Alternatives A, B1, and B2.

Of the 54,799 acres managed with CSU and TL stipulations stated above, Alternative C would impose the Baseline CSU stipulation on 25,942 acres. The application of the Baseline CSU stipulation in Alternative C would have similar impacts to oil and gas development as those described in Alternatives B1 and B2. The Baseline CSU is applied to smaller acreage in Alternative C than in Alternatives B1 (208,185 acres) and B2 (222,289 acres); however, this acreage is managed more restrictively (NSO and closed) in Alternative C than in Alternatives B1 and B2.

In Alternative C, 550,599 acres would be managed with NSO stipulations, which is greater than Alternatives A, B1, and B2. About 416,985 more acres are managed with an NSO stipulation in Alternative C than in Alternative A, 98,290 acres more than Alternative B1, and 51,591 acres more than Alternative B2. NSO stipulations could increase the complexity of mineral operations and slow down production. Development in NSO areas would require the use of more costly methods, such as directional and horizontal drilling, to access oil and gas resources. NSO stipulations would preclude the use of the surface for the development of oil and gas, but would still allow the recovery of these resources at a greater cost. Precluding surface disturbance in areas with NSO stipulations would decrease the number of wells drilled during the planning period.

The closure of 180,169 acres to oil and gas leasing in Alternative C would eliminate opportunities to develop oil and gas resources. This amount of closed area in Alternative C would result in greater impacts to oil and gas development than Alternatives A, B1, and B2 where 753 acres are closed.

Applying BMPs to oil and gas authorizations in Alternative C would have the same impacts to oil and gas development as those described in Alternatives B1 and B2.

Applying Lease Notices for additional resources in Alternative C would have the same impacts to oil and gas development as those described in Alternatives B1 and B2.

The projection for oil and gas development in Alternative C is 9 well pads and 36 wells. This represents 196 fewer wells than projected in Alternative A, 116 fewer wells than projected in Alternative B1, and 152 fewer wells than projected in Alternative B2. Drilling fewer wells could result in less domestic supply of oil and gas and fewer royalties to Federal, State, and local governments.

Impacts from Alternative D

Designating PLAs (103,619 acres) and restricting new oil and gas leasing for the long term in these areas would reduce the total area available for oil and gas leasing in the Planning Area, which would reduce the amount of oil and gas drilling and potential production, similar to Alternative B1.

Under Alternative D, oil and gas leasing would occur on zero acres subject to standard terms and conditions (open). This would mean open acreage, which generally is the least costly to develop, would not be available. This is less open acreage than Alternative A and is the same open acreage as Alternatives B1, B2, and C.

There are about 230,765 acres managed with CSU and TL stipulations in Alternative D. The impacts of the CSU stipulations in Alternative D are similar to those described in Alternative A, but like Alternatives B1, B2, and C apply to more resources. The CSU stipulations applied in Alternative D may result in additional costs and delays to oil and gas operators as compared to the CSU stipulations applied in Alternative A. The TL stipulations applied in Alternative D are similar to those applied in Alternative A and would result in similar impacts. Alternative D applies CSU and TL stipulations to 209,591 fewer acres than Alternative A, 1,839 fewer acres than Alternative B1, 55,041 more acres than Alternative B2, and 175,966 fewer acres than Alternative C. However, acreage in Alternative C is managed more restrictively (NSO and closed) than in Alternatives A, B1, B2, and D.

Of the 237,655 acres managed with CSU and TL stipulations stated above, Alternative D would impose the Baseline CSU stipulation on 213,218 acres. The application of the Baseline CSU stipulation in Alternative D would have similar impacts to oil and gas development as those described in Alternatives B1 and B2. The Baseline CSU stipulation is applied to similar acreage as in Alternatives B1 and B2 and less than Alternative C. However, acreage is managed more restrictively (NSO and closed) in Alternative C

than in Alternatives B1, B2, and D. Alternative D provides an exception to the Baseline CSU stipulation regarding the 2 mile spacing requirement that would provide more flexibility for oil and gas development. This exception is not provided in Alternatives B1, B2, and C.

In Alternative D, 305,899 acres would be managed with NSO stipulations, which is greater than Alternative A and less than Alternatives B1 (452,269 acres), B2 (499,008 acres), and C (550,599 acres). NSO stipulations could increase the complexity of mineral operations and slow down production. Development in NSO areas would require the use of more costly methods, such as directional and horizontal drilling, to access oil and gas resources. NSO stipulations would preclude the use of the surface for the development of oil and gas, but would still allow the recovery of some of these resources at a greater cost. Precluding surface disturbance in areas with NSO stipulations would decrease the number of wells drilled during the planning period. Alternative D provides an exception to the NSO stipulation pertaining to VRM Class II areas that allows for oil and gas operations that are not visible from key observation points. This exception could allow for more flexibility and some additional well drilling in VRM Class II areas as compared to Alternatives B1, B2, and C.

The closure of 145,284 acres to oil and gas leasing in Alternative D would eliminate opportunities to develop oil and gas resources. The amount of closed area in Alternative D would result in greater impacts to oil and gas development than Alternatives A, B1, and B2 where 753 acres are closed and less than Alternative C where 180,169 acres are closed.

Applying BMPs to oil and gas authorizations in Alternative D would have the same impacts to oil and gas development as those described in Alternatives B1, B2, and C.

Applying Lease Notices for additional resources in Alternative D would have the same impacts to oil and gas development as those described in Alternatives B1, B2, and C.

The projection for oil and gas development in Alternative D is 42 well pads and 168 wells. This represents 64 fewer wells than projected in Alternative A, 16 more wells than projected in Alternative B1, 20 fewer wells than projected in Alternative B2, and 132 more wells than Alternative C. Drilling more wells than in Alternative C could result in greater domestic supply of oil and gas and more royalties to Federal, State, and local governments.

4.8.2 Potash

This section presents potential impacts to potash leasing from implementing management actions presented in Chapter 2. Existing conditions concerning potash management are described in Chapter 3.

Assumptions

- Potash leasing, exploration, and development would occur in the Planning Area during the planning period. This assumption is predicated on additional economic assumptions:

    1) Potash market prices rebound sufficiently to make extraction economically viable. As of September 2014, the price of potash was $287 per ton. Estimates for new production facilities in Saskatchewan, for example, with potash deposits at shallower depths than the potash deposits in the Planning Area, require a market price of over $400 per ton to be economically viable. Expansion of *existing* facilities, however, requires a potash price of approximately $200 per ton to be economically viable, resulting in a potentially competitive disadvantage for new facilities in the Planning Area (GenSource Potash Corp 2013, Mineweb 2013).

    2) Related to the above, sufficient investment capital would need to be acquired. First year costs under Alternative A, for example, could total more than $2.99 billion. This figure represents over 3.5 times the size of total economic output in Grand and San Juan Counties combined in 2012 (IMPLAN V3.1). The uncertainty over future potash prices may make the raising of this much investment capital problematic. The capital costs exclude infrastructure costs such as pipelines, roads, power lines, and importantly, rail access. These costs could increase overall development costs significantly.

- Disturbed areas would be successfully reclaimed within a scope of 10 years. It is also assumed that there would be an average of 4 well bores per production well pad and 1 well bore per non-production well pad.

- Potash leasing would be considered under Alternatives A, B1, and D. No potash leases or prospecting permits would be issued under Alternatives B2 or C.

- Leaseholders have the right to explore, develop, and produce potash resources from any valid, existing lease, even if the area containing the lease were proposed to be closed to future leasing.

- A valid, existing potash lease is a legal contract secured by a leaseholder before the effective date of the Planning Area Notice of Intent for the MLP process.

- The resource protection measures identified in the Moab MLP will also apply to areas currently under lease where they do not conflict with the rights granted to the holder of the lease. While the BLM may not unilaterally add a new stipulation to an existing lease that it has already issued, the BLM can subject the development of existing leases to reasonable measures in order to minimize impacts to other resource values. These reasonable measures would be applied as Conditions of Approval to post lease actions (e.g. exploration or production well approvals) and may include, but are not limited to, modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures.

- For potash mining operations utilizing solar evaporation processing methods, it is assumed that the operations would utilize 5,000 gallons of water per ton of potash production. For potash mining operations utilizing crystallization processing methods, it is assumed that the operations would

utilize about 1,300 gallons of water per ton of potash production. Water would be obtained from 1) major rivers, 2) aquifers, or 3) local sources.

The projection for future potash development and the associated surface disturbance is displayed in Table 4-17.

Table 4-17. Projected Potash Development and Surface Disturbance on Bureau of Land Management Lands (over next 15 years)

Action	Alternative A	Alternative B1	Alternative B2	Alternative C	Alternative D
Solar Evaporation Processing					
Potash annual production (tons per year)	400,000	300,000	0	0	300,000
Solar evaporation ponds (acres disturbed)	2,400	1,800	0	0	1,800
Processing plant(s) (acres disturbed)	1,316	987	0	0	987
Production well pads[1] (number of pads)	18	12	0	0	12
Production well pads (acres disturbed)	108	72	0	0	72
Crystallization Processing					
Potash annual production (tons per year)	2,000,000	1,000,000	0	0	1,020,000
Processing plant (acres disturbed)	500	250	0	0	250
Production well pads[1] (number of pads)	86	42	0	0	45
Production well pads (acres disturbed)	516	252	0	0	270
Surface Disturbance for Non-production Wells (exploration, water, disposal, monitoring)					
Exploration and miscellaneous wells[1] (number of wells)	133	72	0	0	72
Exploration and miscellaneous wells (acres disturbed)	599	323	0	0	323

Action	Alternative A	Alternative B1	Alternative B2	Alternative C	Alternative D
Net surface disturbance after reclamation (acres disturbed)	309	167	0	0	167

[1] It is assumed that there would be an average of 4 well bores per production well pad and 1 well bore per non-production well pad.

Predicted surface disturbance on BLM lands for potash operations utilizing solar evaporation processing methods was based on the assumption that the projected development in the RFD could be achieved on the lands open for leasing under Alternative A. For Alternatives B1 and D, the predicted surface disturbance for potash development is derived by multiplying the percentage of lands open for leasing in the Red Wash and Ten Mile PLAs by the potash development estimated in the RFD for operations utilizing solar evaporation processing. The PLAs include the lands where the BLM has determined that future development is most likely to occur utilizing solar evaporation processing. The assumptions for lands open to leasing are the same as those stated for oil and gas.

Predicted surface disturbance on BLM lands for potash operations utilizing crystallization processing methods was based on the assumption that the projected development in the RFD could be achieved on the lands open for leasing under Alternative A. For Alternatives B1 and D, the predicted surface disturbance for potash operations utilizing crystallization processing is derived by multiplying the percentage of lands open for leasing in the Hatch Wash PLA by the potash development estimated in the RFD for operations utilizing crystallization processing. The PLA includes the land where the BLM has determined that future development is most likely to occur utilizing crystallization processing. The assumptions for lands open to leasing are the same as those stated for oil and gas.

Impacts Common to All Alternatives

The economic costs of applying lease stipulations by alternative are found in the socio-economic section.

Meeting National Air Quality Standards could result in additional emission control requirements that could result in delays and extra costs for potash operations on Federal lands.

Requiring that project specific analysis require the use of quantitative air quality analysis methods (i.e., modeling) when appropriate would result in potential delays and additional costs.

Applying Lease Notices for complying with mitigation requirements for raptors, migratory birds, and species included in both the Threatened and Endangered Species Act and the Special Status Species list could result in delays and additional costs to potash operations.

See discussion of overlapping timing limitations and their impacts on minerals under Minerals: Oil and Gas, Impacts Common to All Alternatives.

Applying a TL stipulation for the Lockhart Basin desert bighorn sheep herd could result in delays and additional cost to potash operations.

Impacts from Alternative A (No Action)

Under Alternative A, potash leasing could occur on 210,884 acres subject to standard terms and conditions (open), which would provide the most flexibility for potash exploration and development. Potash operations conducted in open areas would generally impose the least cost to operators.

There are about 440,386 acres managed with CSU and TL stipulations in Alternative A. These stipulations may result in additional costs and delays to potash operators by limiting the siting of operations and requiring specialized equipment, design considerations, and erosion control plans. TL stipulations would result in additional costs and delays by requiring surveys, avoidance of occupied areas, rerouting of roads and pipelines, and re-siting of potash production and processing facilities, or extra operational time if the surface disturbance window does not accommodate an individual project schedule and timeline and project activities need to be postponed.

In Alternative A, 133,574 acres would be managed with an NSO stipulation. NSO stipulations could increase the complexity of potash operations and slow down production. Development in NSO areas would require the use of more costly methods, such as directional and horizontal drilling, to access potash resources. NSO stipulations would preclude the use of the surface for the production of potash, but would still allow the recovery of these resources at a greater cost. Precluding surface disturbance in areas with NSO stipulations would decrease the number of wells drilled during the planning period. NSO stipulations would preclude the construction of potash processing facilities.

The closure of 753 acres to potash leasing in Alternative A would eliminate opportunities to develop potash resources in those areas. Potash processing facilities could not be located in closed areas.

The projection for potash development for this alternative is 104 well pads and 416 production wells. In addition, there would be 133 non-production wells. Solar evaporation processing operations would involve 2,400 acres for evaporation ponds and 1,316 acres for a processing plant. Crystallization processing operations would involve 500 acres for a processing plant. In Alternative A, potash production is projected at 400,000 tons per year for solar evaporation processing operations and 2,000,000 per year for crystallization processing operations. Water consumption associated with solar evaporation processing operations is estimated at 5,000 gallons per ton of potash production for a total of about 2 billion gallons per year. Water consumption associated with crystallization processing operations is estimated at 1,300 per ton of potash production for a total of about 2.6 billion gallons per year. The source of this water could come from one of three sources: 1) rivers and other surface water, 2) groundwater, or 3) offsite locations. However, detailed impacts of this water use cannot be addressed until site specific operations identify the water source.

Applying BMPs to all oil and gas authorizations, in accordance with WO IM 2007-021 and the *Gold Book*, could delay potash development or affect the location and timing of development. BMPs for health and safety along U.S. 191 and I-70, saline soils, and water quality could delay potash development or affect the location and timing of development in these areas. The use of BMPs could increase the complexity and time involved in developing potash and could lead to increased costs.

Impacts from Alternative B

Impacts Specific to Alternative B1 Only

Restricting new potash leasing to PLAs (103,619 acres) would limit the amount of potash development within the Planning Area and reduce potential potash production as compared to Alternative A. However, the identified PLAs include blocks of public land in areas where potash leases (Upper Ten Mile) or potash permits (Red Wash and Hatch Point) have been issued. Within these areas, potash resources have been

identified and the feasibility of potash production is being pursued. While Upper Ten Mile and Red Wash PLAs are largely unleased for oil and gas, 43 percent of the Hatch Point PLA has existing oil and gas lease. This could create some conflict and competition for access to mineral resources in light of the Baseline CSU stipulation's well spacing requirements.

Limiting the location of potash processing facilities by designating 42,492 acres as PPFAs would limit the areas available for the location of such facilities. Although transporting potash from PLAs to PPFAs would involve some complexities, such as slurrying potash by pipeline, as well as other additional costs, the location of the PPFAs are within proximity to roads, highways, utilities, and railroads. Therefore, the location of PPFAs could simplify distribution and save time in the development of potash resources.

Of the 103,619 acres within PLAs, 57,620 acres would be managed with CSU and TL stipulations in Alternative B1. Managing with CSU and TL stipulations would have the same impacts to potash leasing and development as those discussed in Alternative A, except on fewer acres.

Of the 57,620 acres managed with CSU and TL stipulations stated above, Alternative B1 would impose the Baseline CSU stipulation on 53,689 acres. The application of the Baseline CSU stipulation could reduce or delay the production of potash and increase the complexity of operations. Restricting well pads to no closer than 2 miles apart could reduce the effectiveness of extracting potash in some areas due to the unknowns associated with solution mining deep potash deposits in the area. The collocation of facilities could increase the complexity of operations. Requiring extensive interim reclamation and offsite mitigation could increase costs to potash operators.

Of the 103,619 acres within PLAs, 45,999 acres would be managed with NSO stipulations. These NSO stipulations would have the same impacts to potash leasing and development as those described in Alternative A, except on a proportionally higher amount of land that is available for potash leasing.

Applying BMPs to potash authorizations could delay potash development or affect the location and timing of development in these areas. The use of BMPs could increase the complexity and time involved in developing potash and could lead to increased costs. In Alternative B1, BMPs are applied to more resources than in Alternative A and would result in greater impacts to potash development.

Applying Lease Notices for additional resources in Alternative B1 would result in more delays and additional costs to potash operations than those resulting from the Lease Notices applied to all alternatives.

The projection for potash development for Alternative B1 is 54 well pads and 216 production wells. In addition, there would be 72 non-production wells. Solar evaporation processing operations would involve 1,800 acres for evaporation ponds and 987 acres for a processing plant. Crystallization processing operations would involve 250 acres for a processing plant. In Alternative B1, potash production is projected at 300,000 tons per year for solar evaporation processing operations and 1,000,000 per year for crystallization processing operations. This is a total of 1,100,000 fewer tons of potash production than projected in Alternative A. Less potash production in Alternative B1 would result in fewer royalties to Federal, State, and local government. Water consumption associated with solar evaporation processing operations is estimated at 5,000 gallons per ton of potash production for a total of about 1.5 billion gallons per year. Water consumption associated with crystallization processing operations is estimated at 1,300 per ton of potash production for a total of about 1.3 billion gallons per year. The source of this water could come from one of three sources: 1) rivers and other surface water, 2) groundwater, or 3) offsite locations. However, the impacts of this water use cannot be addressed until site specific operations identify the water source. In Alternative B1, water consumption for potash production would be less than in Alternative A.

Impacts Specific to Alternative B2 Only

Under Alternative B2, the entire Planning Area (785,567 acres) would be closed to new potash leasing and associated development. Therefore, there would be no economic benefits derived from the development of new potash leases in the Planning Area. This would result in a diminished supply of domestically produced potash.

Impacts from Alternative C

Closing the entire Planning Area (785,567 acres) to new potash leasing would have the same impact as Alternative B2.

Impacts from Alternative D

Restricting new potash leasing to PLAs (103,619 acres) would have generally the same impacts to potash development as those described in Alternative B1. However, Alternative D provides an exception to the Baseline CSU stipulation regarding well spacing, as well as an exception allowing for small scale potash processing facilities (10,000 tons per year) within the PLAs. The exception to the Baseline CSU stipulation provides more flexibility for potash well drilling. The exception for small scale potash processing facilities within PLAs provides more flexibility for testing the feasibility of potash production and could result in the production of additional potash resources.

Limiting the location of potash processing facilities by designating 42,492 acres as PPFAs would have the same impacts to potash leasing and development as those described in Alternative B1.

Of the 103,619 acres within PLAs, 57,308 acres would be managed with CSU and TL stipulations in Alternative D. Impacts to potash leasing and development resulting from the CSU and TL stipulations applied in Alternative D are the same as those described in Alternative B1.

Of the 57,808 acres managed with CSU and TL stipulations stated above, Alternative D would impose the Baseline CSU stipulation on 54,186 acres. The impacts of applying the Baseline CSU stipulation in Alternative D would be similar to those described in Alternative B1. However, the difference between the Baseline CSU stipulation in Alternatives B1 and D is the exception of the well spacing requirement as noted above under PLAs in Alternative D.

Of the 103,619 acres within PLAs, 46,311 acres would be managed with NSO stipulations. Impacts to potash leasing and development resulting from the NSO stipulations applied in Alternative D are the same as those described in Alternative B1.

Applying BMPs to potash authorizations would have the same impacts to potash leasing and development as those described in Alternative B1. In Alternatives B1 and D, BMPs are applied to more resources than in Alternative A and would result in greater impacts to potash development.

Applying Lease Notices for additional resources in Alternative D would have the same impacts to oil and gas development as those described in Alternative B1.

The potential impacts resulting from potash development in Alternative D are essentially the same as Alternative B1.

4.9 PALEONTOLOGICAL RESOURCES

The loss of any identifiable paleontological resource that could yield important information that provides information about the history of life on Earth or embodies the distinctive characteristics of a type of organism, environment, period of time, or geographic region, would result in an adverse impact. Impacts on paleontological resources primarily concern the potential destruction of non-renewable paleontological resources and the loss of information associated with these resources. This includes the unlawful or unauthorized collection of paleontological resource remains. If fossiliferous bedrock or surficial sediments are disturbed, the disturbance could result in the destruction of paleontological resources and subsequent loss of information.

4.9.1 Assumptions

- Scientifically significant paleontological resources would continue to be found within the Planning Area throughout several geologic formations exposed at the surface.

- Inventories required prior to surface disturbance in high-probability areas would result in the identification and evaluation of previously undiscovered resources, which the BLM would then manage accordingly.

- Surface-disturbing and other disruptive activities could dislocate or damage paleontological resources that were not discovered prior to surface disturbance (i.e., unanticipated discoveries). Destruction of these resources would result in a loss of scientific information and preclude interpretation of the resource values to the public.

- In some cases, surface-disturbing activities, such as mineral development, can expose fossils that would have otherwise remained undiscovered.

4.9.2 Impacts Common to All Alternatives

There are no impacts to paleontological resources common to all alternatives.

4.9.3 Impacts from Alternative A (No Action)

Under Alternative A, oil and gas and potash leasing and development could occur concurrently within the same tract of land, which could result in a greater concentration of development and redundant infrastructure. Although drilling for oil and gas and potash is similar, the production of potash requires the use of potash processing facilities, which involve large tracts of land over a long period of time. Mineral development could result in damage to paleontological resources.

Under Alternative A, 651,270 acres would be available to both oil and gas and potash leasing and development, managed as either open with standard terms and conditions (210,884 acres) or with CSU and TL stipulations (440,386 acres), comprising about 83 percent of the Planning Area. Surface-disturbing activities could damage or destroy unidentified paleontological resources either directly, or through soil compaction and removal, which can lead to accelerated erosion and exposure of fossils. Impacts on unknown paleontological resources would often be greater than impacts on resources that had been previously identified (and thereby either avoided or subjected to mitigation measures) because recordation and evaluation of those unknown resources would not occur prior to any damage to them. These impacts would complicate mitigation procedures and result in a loss of scientific information. If paleontological resources that are discovered during disturbance activities should remain salvageable, further impacts could be mitigated through recovery of the fossil material and related data.

Within areas managed as open to leasing with standard terms and conditions or with CSU and TL stipulations, projected development for oil and gas and potash would occur and the associated surface disturbance could adversely impact paleontological resources. Because oil and gas and potash leasing and development, including potash processing facilities, could occur on the same tracts of land within these 651,270 acres, there is a higher likelihood for greater surface disturbance than would otherwise occur if the minerals were to be developed separately and thus more potential for adverse impacts to paleontological resources.

The remaining 17 percent of the Planning Area is subject to NSO stipulations (133,574 acres) or closed to mineral leasing (753 acres). These major constraints would protect paleontological resources within these areas by precluding surface-disturbing activities.

Attaching lease notices, stipulations, and other requirements to permitted activities would further prevent adverse impacts to paleontological resources, as would conducting onsite evaluation of surface-disturbing activities for all Class 5 areas and evaluating the type of surface disturbance proposed and mitigation development based on site-specific information. Along with onsite evaluations, surface disturbances could also expose fossils to discovery that would otherwise have been buried until exposed by natural erosion, thereby enhancing scientific knowledge.

4.9.4 Impacts from Alternative B

Under this alternative, maximizing the size of oil and gas lease parcels could indirectly minimize impacts to paleontological resources within these areas. The likelihood of redundant infrastructure would be reduced, which could in turn reduce the amount of surface disturbance associated with construction of this infrastructure (e.g., pipelines, well pads, and roads).

As compared to Alternative A, maximizing the size of oil and gas lease parcels could reduce oil and gas development and infrastructure, which could reduce possible changes to scenic elements of the landscape, preserve scenic quality, and prevent changes in line, form, color, and texture of the visual environment as compared to Alternative A.

Applying a CSU stipulation requiring the survey and monitoring for all surface-disturbing mineral activities in potential fossil yield classification (PFYC) areas 4 and 5 (118,952 acres) would minimize adverse impacts to paleontological resources within these areas. When monitoring encounters vertebrate and vertebrate trace fossils during mineral operations, all operations would cease until the BLM Authorized Officer determines whether the site can be avoided, protected, or must be fully excavated, reducing further the likelihood of adverse impacts to paleontological resources. This CSU stipulation provides an additional level of protection for paleontological resources as compared to Alternative A.

Applying BMPs to minimize potential runoff and soil erosion from mineral development and facilitate revegetation from mineral development would indirectly minimize impacts to paleontological resources by reducing the potential for degradation of paleontological resources within the bedrock/soil matrix. BMPs for mineral operations were not specifically addressed in Alternative A.

Applying the Baseline CSU stipulation to oil and gas and potash leasing in areas with sensitive resources in order to minimize the amount of surface disturbance and related impacts resulting from mineral development could indirectly reduce adverse impacts to paleontological resources within these areas as compared to Alternative A. The Baseline CSU stipulation would apply to 208,185 acres under Alternative B1 and 222,289 acres in Alternative B2.

Impacts Specific to Alternative B1 Only

Not issuing new oil and gas leases within PLAs (103,619 acres) could help to minimize adverse impacts to paleontological resources found within these areas. These adverse impacts could result from concurrent oil and gas development and potash development that could occur under Alternative A. However, 43 percent of the Hatch Point PLA contains existing oil and gas leases. Therefore, there is potential for concurrent development of oil and gas and potash on these existing leases and a greater likelihood for adverse impacts to paleontological resources. Allowing potash leasing and development within PLAs on 103,619 acres could result in impacts to paleontological resources that may be found in these areas from surface-disturbing potash related activities. If the acreage encompassed by PLAs were to become available solely for oil and gas leasing and development the adverse impacts to paleontological resources would be similar to or less than the impacts identified for potash leasing and development. Alternative B1 does not allow potash leasing on 681,948 acres within the Planning Area, which would minimize adverse impacts to paleontological resources from concurrent oil and gas and potash development as compared to Alternative A.

A phased approach to potash leasing could help reduce impacts to paleontological resources as compared to Alternative A. By testing the feasibility of potash development, unnecessary surface disturbance would be avoided and appropriate mitigation measures applied. These measures would benefit paleontological resources.

PLAs would be identified in the Upper Ten Mile area (29,127 acres), the Red Wash area where potash prospecting permits have been issued (29,956 acres), and the Hatch Point area where potash prospecting permits have been issued (44,536 acres) and contains existing oil and gas leases. The PLAs would total 103,619 acres. Designating these PLAs could impact paleontological resources within these areas, especially where prospecting permits result in potash leases and areas where there is a higher concentration of fossils, would result in surface-disturbing activities associated with potash leasing, and could result in damage to previously unknown paleontological resources. In particular, the Upper Ten Mile PLA overlaps known PFYC 5 locations, so the potential for impacts to paleontological resources would be higher in this area. However, applying a phased leasing approach to potash leasing within the Planning Area would minimize impacts to paleontological resources from potash leasing and development over the long term, as additional potash leasing would require further analysis of environmental impacts to paleontological resources. By testing the feasibility of potash development, unnecessary surface disturbance would be avoided and appropriate mitigation measures could be applied. If the acreage encompassed by PLAs were to become only available for oil and gas leasing and development, the adverse impacts to paleontological resources would be similar to or less than the impacts identified for potash leasing and development.

Within the PLAs, CSU and TL stipulations for potash leasing would be applied to 57,620 acres (87 percent less than Alternative A). There are zero acres managed as open with standard terms and conditions (open) to potash leasing in Alternative B1. Projected potash well drilling would occur within these areas subject to CSU and TL stipulations (minor constraints). The associated surface disturbance could adversely impact paleontological resources. In addition, there are about 45,999 acres within the PLAs that are subject to NSO stipulations, which would protect paleontological resources by precluding potash surface development. The total area managed as open and with minor constraints to potash leasing and development in Alternative B1 is about 593,650 acres less than Alternative A. Therefore, adverse impacts to paleontological resources associated with potash development are less likely in Alternative B1 as compared to Alternative A.

Applying a CSU stipulation to all potash leases that requires processing facilities to be located within a PPFA (42,492 acres) could minimize impacts to paleontological resources from establishing potash facilities as compared with Alternative A. Of these 42,492 acres, 3,519 acres are in PFYC 5 (8 percent).

In areas where these facilities are constructed, localized paleontological resources could be adversely impacted if previously unknown resources were damaged during construction. About 3,037 acres of surface disturbance, and the associated potential adverse impacts to paleontological resources, could result from the construction of potash processing facilities within the PPFAs. Alternative B1 would result in 1,179 fewer acres of potential disturbance to paleontological resources than Alternative A from the construction of potash processing facilities.

CSU and TL stipulations (minor constraints) for oil and gas leasing would be applied to 228,926 acres (29 percent of the Planning Area). There are zero acres managed as open to oil and gas leasing under standard terms and conditions (open). These areas managed as open to oil and gas leasing and with minor constraints comprise about 29 percent of the Planning Area, which is 48 percent less than Alternative A. The area managed as open and with minor constraints to oil and gas leasing and development is about 422,344 acres less than Alternative A. Within these areas, projected development for oil and gas would occur and the associated surface disturbance could adversely impact paleontological resources. Therefore, there is much less likelihood for adverse impacts to paleontological resources associated with oil and gas development in Alternative B1 as compared to Alternative A.

In Alternative B1, about 58 percent of the Planning Area is subject to NSO stipulations (452,269 acres) and closed to oil and gas leasing (753 acres). These major constraints would protect paleontological resources within these areas by precluding development. The area covered by major constraints for oil and gas leasing and development is about 313,723 acres more than Alternative A. Therefore, Alternative B1 offers far more protection for paleontological resources from adverse impacts associated with oil and gas leasing and development than Alternative A.

Impacts Specific to Alternative B2 Only

In Alternative B2, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would reduce impacts to paleontological resources that would result from the concurrent development of oil and gas and potash as described in Alternative A. The impacts to paleontological resources from the limited potash development provided in Alternative B1 would be greater than the exclusion of potash development in Alterative B2.

Alternative B2 would substitute oil and gas well drilling for potash well drilling within the PLAs established in Alternative B1 and the impacts to paleontological resources would be similar. The major difference between Alternative B1 and Alternative B2 is that Alternative B2 eliminates the 3,037 acres of surface disturbance, and the associated potential adverse impacts to paleontological resources, that could result from the construction of potash processing facilities within the 42,492 acres of PPFAs established in Alternative B1.

CSU and TL stipulations (minor constraints) for oil and gas leasing would be applied to approximately 285,806 acres (35 percent less than Alternative A). There are zero acres managed as open with standard terms and conditions (open). These areas managed as open and with minor constraints to oil and gas leasing and development comprise about 36 percent of the Planning Area. Within these areas, projected development for oil and gas would occur and the associated surface disturbance could adversely impact paleontological resources. However, the area managed as open and with minor constraints for oil and gas leasing and development is about 365,464 acres less than Alternative A. Therefore, there is much less likelihood for adverse impacts to paleontological resources associated with oil and gas development in Alternative B2 as compared to Alternative A.

In Alternative B2, about 64 percent of the Planning Area is subject to NSO stipulations (499,008 acres) and closed to oil and gas leasing (753 acres). These major constraints would protect paleontological resources within these areas by precluding development. The area covered by major constraints for oil and gas leasing and development is about 360,466 acres more than Alternative A. Therefore, this Alternative would provide more protections to paleontological resources from impacts associated with oil and gas leasing and development than Alternative A.

4.9.5 Impacts from Alternative C

In Alternative C, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would result in the same impacts to paleontological resources as those described in Alternative B2.

Application of a CSU stipulation requiring survey and monitoring for all disturbing surface mineral activities in PFYC areas 3, 4, and 5 (265,689 acres) provides more protection to paleontological resources than Alternative B, which only provides for surveys and monitoring in PFYC areas 4 and 5.

Impacts to paleontological resources from maximizing the size of oil and gas lease parcels would be the same as those described in Alternative B.

Impacts to paleontological resources from developing BMPs as appropriate to minimize the potential resource impacts associated with mineral development would be the same as those described in Alternative B.

Impacts from applying a Baseline CSU stipulation in areas with sensitive resources in order to minimize the amount of surface disturbance and related impacts resulting from mineral development would be the same as those described in Alternative B.

Under Alternative C, CSU or TL stipulations (minor constraints) for oil and gas leasing would be applied to 54,799 acres. There are zero acres managed as open to oil and gas leasing with standard terms and conditions. These areas managed as open to oil and gas leasing and with minor constraints to oil and gas leasing and development comprise about 7 percent of the Planning Area. Within these areas, projected development for oil and gas would occur and the associated surface disturbance could adversely impact previously unknown paleontological resources, but the area managed as open and with minor constraints is much less than in Alternative A (596,471 fewer acres). Thus, the likelihood for adverse impacts to paleontological resources from oil and gas development would be much less than Alternative A.

In Alternative C, about 93 percent of the Planning Area is subject to NSO stipulations (550,599 acres) and closed to oil and gas leasing (180,169 acres). These major constraints would protect paleontological resources within these areas by precluding development. The area covered by major constraints for oil and gas leasing and development is far more than Alternatives A, B1, and B2. Therefore, Alternative C offers far more protection for paleontological resources from impacts associated with oil and gas leasing and development than Alternatives A, B1, and B2.

4.9.6 Impacts from Alternative D

Impacts to paleontological resources from maximizing the size of oil and gas lease parcels would be the same as those described in Alternatives B and C.

Impacts to paleontological resources from developing BMPs, as appropriate, to minimize the potential resource impacts associated with mineral development would be the same as those described in Alternatives B and C.

Impacts to paleontological resources from applying a Baseline CSU stipulation in areas with sensitive resources in order to minimize the amount of surface disturbance and related impacts resulting from mineral development would be the same as those described in Alternatives B1, B2, and C. However, Alternative D provides an exception to the Baseline CSU stipulation, which would allow some additional mineral development that could potentially result in greater adverse impacts to paleontological resources than those in Alternative B1.

Applying a CSU stipulation requiring surveying and monitoring for all surface-disturbing mineral activities in PFYC areas 4 and 5 would be the same as those described in Alternative B; however, Alternative C provides and additional level of protection by adding PFYC 3 areas to the CSU stipulation.

Not issuing new oil and gas leases within PLAs (103,619 acres) would provide the same protections to paleontological resources as discussed in Alternative B1, while applying a phased leasing approach to limit potash leasing within the Planning Area would have the same impacts to paleontological resources as discussed in Alternative B1. However, an exception allowing small scale potash processing facilities of 100 acres or less of surface disturbance in PLAs could have the potential to adversely affect paleontological resources.

Designating a PLA in the Upper Ten Mile area, the Red Wash area where potash prospecting permits have been issued, and the Hatch Point area where potash prospecting permits and oil and gas leases have been issued would have the same impacts to paleontological resources as discussed under Alternative B1.

Applying a CSU stipulation to all potash leases that requires processing facilities to be located within a PPFA (42,492 acres) would have the same impacts to paleontological resources as discussed in Alternative B1.

Under Alternative D, about 230,765 acres would be open to oil and gas leasing subject to CSU and TL stipulations (minor constraints). There are zero acres managed as open to oil and gas leasing with standard terms and conditions (open). These areas, which are managed as open and with minor constraints to oil and gas leasing and development, comprise about 29 percent of the Planning Area. Within these areas, projected development for oil and gas would occur and the associated surface disturbance could adversely impact paleontological resources. The area managed as open and with minor constraints for oil and gas leasing and development is about 420,505 acres less than Alternative A. Therefore, there is much less likelihood for adverse impacts to paleontological resources associated with oil and gas development in Alternative D as compared to Alternative A; a similar likelihood for adverse impacts as compared to Alternatives B1 and B2; and a greater likelihood for adverse impacts as compared to Alternative C.

About 57 percent of the Planning Area is subject to NSO stipulations (305,899 acres) and closed to oil and gas leasing (145,284 acres). These major constraints would protect paleontological resources within these areas by precluding development. The area covered by major constraints for oil and gas leasing and development is about 311,888 acres more than Alternative A; slightly less (1,839 acres) than Alternative B1, less than (48,578 acres) Alternative B2; and much less than (279,585 acres) than Alternative C. Therefore, Alternative D offers far more protection for paleontological resources from impacts associated with oil and gas leasing and development than Alternative A; similar protection than Alternatives B1 and B2; and much less than Alternative C.

Alternative D also provides an exception to the NSO stipulation for visual resources that could result in some additional mineral development activity and surface disturbance that could disrupt paleontological resources. This exception means that Alternative D provides less protection to paleontological resources than does Alternative B1.

In Alternative D, about 103,619 acres would be available to potash leasing and development within the PLAs. Within the PLAs, there are about 57,620 acres open to potash leasing and development subject to CSU and TL stipulations (minor constraints), and zero acres managed as open with standard terms and conditions (open). Projected potash well drilling would occur within the PLAs in the areas managed as open and with minor constraints and the associated surface disturbance could adversely impact paleontological resources. The area managed as open and with minor constraints to potash leasing and development in Alternative D is about 593,650 acres less than Alternative A and the same as Alternative B1. Therefore, there is a much smaller likelihood for adverse impacts to paleontological resources associated with potash development in Alternative D as compared to Alternative A. In addition, out of the 103,619 acres available for potash leasing, about 45,999 acres are subject to NSO stipulations, which would protect paleontological resources by precluding potash development. In Alternatives B2 and C, no leasing and development of potash would occur.

4.10 RECREATION

This section presents potential impacts to recreation from implementing management actions presented in Chapter 2. Existing conditions concerning recreation management are described in Chapter 3.

4.10.1 Assumptions

- The demand for most recreation activities would continue to increase. The compound growth rate over the last 10 years was 3.1 percent. This trend is expected to continue.
- Most recreation use in the Planning Area is for private use.
- Recreation use is dispersed throughout the Planning Area; however, recreation use in some areas is more concentrated.
- The designated Special Recreation Management Areas (SRMA) and recreation Focus Areas would continue to be managed to provide recreation opportunities that meet recreational user expectations and demand.

4.10.2 Impacts Common to All Alternatives

Compliance with air quality standards and dust abatement requirements could maintain the quality of outdoor recreation experiences where scenery and viewsheds are part of the recreational experience.

Applying an NSO stipulation along the U.S. Highway 191 utility corridor would protect the many trailheads and trail segments adjacent to the corridor from visual obstructions and noise. This would protect the quality of recreational settings along the corridor.

4.10.3 Impacts from Alternative A (No Action)

Applying an NSO stipulation along the Green and Colorado Rivers would protect the viewshed and soundscape of recreational activities along the rivers, such as boating and camping.

Allowing mineral industry traffic on the Needles Overlook and Anticline Overlook Roads could lead to heavy truck traffic in areas of popular recreation use, which could create poor road conditions, industrial level traffic, and fugitive dust that could degrade recreation experiences and could conflict with recreational use within the Canyon Rims SRMA.

VRM objectives could help protect viewsheds of areas where filming occurs and indirectly protect the quality of viewsheds enjoyed by casual use recreationists. However, the lack of lease stipulations specifically designed to protect specific areas could lead to mineral development that could degrade the recreational experience in the viewsheds currently available for filming.

Not applying lease stipulations specifically for the mitigation of potential impacts to lands with wilderness characteristics analyzed in the 2008 RMPs (192,220 acres) could lead to degradation of the values associated with primitive forms of recreation, such as opportunities for primitive, unconfined recreation, and solitude.

Under Alternative A, oil and gas and potash leasing and development could occur concurrently within the same tract of land, which could result in a greater concentration of development and redundant infrastructure. Although drilling for oil and gas and potash is similar, the production of potash requires the use of potash processing facilities, which involve large tracts of land over a long period of time. Mineral

development would result in soil and vegetation disturbance and the presence of permanent structures that could degrade recreational uses and experiences. The noise of construction and operation of mineral facilities, including the presence of work crews, vehicles, and equipment, would degrade recreational opportunities.

Oil and gas and potash leasing could both reduce the quality of recreation experiences in some parts of the Planning Area where roads, trails, dispersed camping, and other such types of recreation occur nearby. Wells and associated facilities, potash processing facilities, pipelines increased road traffic, noise, dust, and the visual impact of facilities in otherwise natural areas could all reduce the quality of recreation experiences and possibly displace recreationists to other areas. Visual impacts of surface disturbance reduce the naturalness of back-country recreation and reduce opportunities for solitude. These impacts would occur primarily on 210,884 acres subject to standard terms and conditions and on 440,386 acres subject to CSU and TL stipulations. CSU and TL stipulations could reduce general overall impacts, such as TL stipulations that coincide with tourist seasons and CSU stipulations that mitigate impacts to visual resources.

Managing 133,574 acres with an NSO stipulation would eliminate most mineral development impacts to recreation, with the possible exception of noise, traffic, and fugitive dust coming from adjacent areas where horizontal drilling might be possible. On 753 acres closed to mineral leasing, mineral development impacts to recreation would be eliminated. While the impacts described in the paragraph above could lead to displacement of recreation visitors, this is not a guarantee, as recreationists come to the Moab area for a variety of reasons and nearly all trails, roads, and other recreation opportunities would remain open for such use. Recent trends have shown that the current level of mineral development adjacent to the Dead Horse Point and Island in the Sky districts did not precipitate a decline in visitors to those two destinations (BLM Moab Field Office, November 2013). The trends cited above, however, would not likely apply to greater concentrations of mineral development and/or large scale mineral infrastructure in areas of heavy recreation use. For example, construction of a large-scale potash production facility along either side of UT 313 could have a major negative impact on recreation visitation to this area, and one for which relocating visitors to other areas within the MLP area likely would not suffice.

Compared to oil and gas leasing, potash leasing, which would occur with the same leasing restrictions and in the same areas as oil and gas, could have more impacts to recreation experiences. Well spacing could be more concentrated and processing facilities would be bigger and more industrial. Together, oil and gas and potash leasing could occur on lands open to leasing with standard terms and conditions and with minor constraints (CSU and TL stipulations) on 83 percent of the Planning Area. Table 4-18 shows recreation resources within mineral leasing stipulation areas.

Table 4-18. Recreation Resources Within Mineral Leasing Stipulation Areas

	Alternative A	Alternative B1	Alternative B2	Alternative C	Alternative D
Oil and Gas Stipulations within SRMAs (acres)					
Open	153,469	0	0	0	0
CSU	229,459	100,104	156,982	0	101,353
NSO	124,163	308,371	354,470	392,918	221,211
Closed	6	0	0	118,534	85,911
Deferred (PLAs)	0	102,977	0	0	102,977
Potash Stipulations within SRMAs (acres)					
Open	153,469	0	0	0	0
CSU	229,459	57,618	0	0	57,306

	Alternative A	Alternative B1	Alternative B2	Alternative C	Alternative D
NSO	124,163	45,358	0	0	45,670
Deferred (outside PLAs)	6	408,476	511,452	511,452	408,476
Oil and Gas Stipulations within Recreation Focus Areas (acres)					
Open	24,325	0	0	0	0
CSU	29,419	12,177	15,474	0	12,367
NSO	34,307	69,342	74,386	57,277	48,274
Closed	4	0	0	32,583	20,878
Deferred (PLAs)	0	8,341	0	0	8,341
Potash Stipulations within Recreation Focus Areas (acres)					
Open	24,325	0	0	0	0
CSU	29,419	3,297	0	0	3,297
NSO	34,307	5,044	0	0	5,044
Deferred (outside PLAs)	4	81,519	89,860	89,860	81,519
Miles of High Use Non-Motorized Trails within Oil and Gas Stipulations					
Open	29	0	0	0	0
CSU	82	0	0	0	0
NSO	53	167	167	71	83
Closed	0	0	0	96	84
Deferred (PLAs)	0	0	0	0	0
Miles of High Use Non-Motorized Trails within Potash Stipulations					
Open	29	0	0	0	0
CSU	82	0	0	0	0
NSO	53	0	0	0	0
Deferred (outside PLAs)	0	167	167	167	167
Miles of High Use Motorized Trails within Oil and Gas Stipulations					
Open	5	0	0	0	0
CSU	75	0	0	0	0
NSO	38	116	119	65	75
Closed	0	0	0	54	44
Deferred (PLAs)	0	3	0	0	0
Miles of High Use Motorized Trails within Potash Stipulations					
Open	5	0	0	0	0
CSU	75	0	0	0	0
NSO	38	2	0	0	2

	Alternative A	Alternative B1	Alternative B2	Alternative C	Alternative D
Deferred (outside PLAs)	0	117	119	119	117
Miles of Scenic Backways and Byways within Oil and Gas Stipulations					
Open	2	0	0	0	0
CSU	110	0	0	0	0
NSO	58	158	174	85	99
Closed	0	0	0	89	59
Deferred (PLAs)	0	16	0	0	16
Miles of Scenic Backways and Byways within Potash Stipulations					
Open	2	0	0	0	0
CSU	110	0	0	0	0
NSO	58	16	0	0	16
Deferred (outside PLAs)	0	158	174	174	158

The impact of managing with an NSO stipulation on recreation is discussed generally above. However, NSO stipulations in specific locations for the purposes of protecting recreation settings and values would have a more relevant effect in protecting recreation uses from the impacts of mineral leasing and development. Applying an NSO stipulation within 0.5 miles of developed recreation sites (24,311 acres) would eliminate most potential mineral conflicts in areas where recreation use is the most concentrated.

Not having mineral lease stipulations that are specifically designed to preserve recreation opportunities could create the potential for activities that may conflict with recreation uses planned for the SRMA, such as increased traffic, visual, and noise impacts. These conflicts could displace some recreationists to other areas.

Applying an NSO stipulation to suitable wild and scenic river segments along the Colorado and Green Rivers could eliminate potential visual and noise impacts that would be incompatible with recreation uses on the river, such as quiet solitude and first class scenery. Closing the Monticello Wild and Scenic River (WSR) Segment 3 would eliminate potential impacts from mineral development to recreation uses on and adjacent to the river.

Applying an NSO stipulation in VRM Class I protects recreation values in those areas, such as opportunities for primitive recreation and solitude. Designated VRM Class II on scenic driving corridors (44,953 acres) would protect the recreation setting along the most traveled places of the Planning Area. Recreation activities such as scenic touring and sightseeing would have reduced potential scenic conflicts from mineral leasing. Applying a CSU stipulation on VRM Class II (324,721 acres), including lands around Arches National Park, could reduce the size and visibility of mineral development structures, although it would not entirely preclude development. This would protect recreation settings where natural viewsheds are important. No specific visual resource protections exist under this alternative to protect viewsheds near Canyonlands National Park and along the Colorado and Green Rivers, nor to protect night skies, which could lead to visual impacts on natural recreation settings, decreasing the value of viewing around many cliffs and panoramas, and dimming views of the night sky.

Not addressing auditory management near National Park boundaries could allow noise from mineral development to disrupt the solitude of the Planning Area and adjacent National Parks.

Under Alternative A, about 651,270 acres are managed as open to mineral leasing and development with standard terms and conditions or with CSU and TL stipulations. This comprises about 83 percent of the Planning Area. Within this area, projected development for oil and gas and potash would occur. As a result, the associated surface disturbance could adversely impact recreation. As oil and gas and potash leasing and development, including potash processing facilities, could occur on the same tracts of land within these 651,270 acres, there is a higher likelihood for greater surface disturbance than would otherwise occur if the minerals were to be developed separately. Thus, there is greater potential for adverse impacts to recreation.

The remaining 17 percent of the Planning Area is subject to NSO stipulations (133,574 acres) and closed to mineral leasing (753 acres). These major constraints would protect recreation within these areas by precluding surface mineral development.

4.10.4 Impacts from Alternative B

Applying a Lease Notice to mitigate visual impacts to cultural sites could reduce visual impacts near areas where viewing of cultural resources exists, which would enhance the visitation experience. This Lease Notice would enhance the viewing of cultural sites as compared to Alternative A.

Applying an NSO stipulation along the Colorado and Green Rivers would have the same impact as under Alternative A.

As compared to Alternative A, applying a CSU stipulation limiting the use of heavy trucks on the Needles Overlook and Anticline Overlook Roads could protect the quality of recreation experiences in and around the Canyon Rims SRMA. Allowing an exception to this CSU stipulation could increase traffic and raise fugitive dust, which would degrade recreation experiences and could conflict with recreational use within the SRMA.

As compared to Alternative A, applying a CSU stipulation on 177,594 acres of designated filming locations could reduce visual impacts to recreational values associated with these areas, such as viewsheds for scenic touring. An exception to this CSU stipulation, which could result in short-term impacts could also temporarily reduce visual quality in filming locations, which could indirectly affect the recreational settings found in these areas.

Applying the Baseline CSU stipulation to lands with wilderness characteristics analyzed in the 2008 RMPs (192,220 acres) could help reduce the impacts to the values associated with primitive forms of recreation, such as opportunities for primitive, unconfined recreation, and solitude as compared to Alternative A.

As compared to Alternative A, maximizing the size of oil and gas lease parcels could reduce oil and gas development and infrastructure that could otherwise increase conflicts with recreation uses and degrade the value of recreation experiences in areas where recreationists seek natural settings.

The use of BMPs for mineral operations could reduce conflicts with recreation as compared to Alternative A. Visual screening using natural colors and topography and auditory dampening would help to protect recreation values in the Planning Area.

As compared to Alternative A, applying the Baseline CSU stipulation to SRMAs would decrease conflicts with recreation uses in those areas (208,185 acres in Alternative B1 and 222,289 acres in Alternative B2),

as well as other areas where wildlife, visual resources, and wilderness characteristics contribute to recreation settings. Actions such as collocating facilities, limiting unreclaimed surface disturbance, and placing pipelines along existing roads, would limit the amount of interaction with recreationists at any one time.

Impacts from oil and gas and potash leasing and development are discussed in the sections below specific to Alternatives B1 and B2. However, some specific mineral lease stipulations related to protecting recreation settings and values are applied in Alternative B and would have a direct effect in protecting recreation uses from the impacts of mineral leasing and development. Increasing the NSO around developed recreation sites from 0.5 mile to 1 mile would increase the protection of recreation settings as compared to Alternative A. Applying an NSO stipulation within 0.5 miles of high use routes (95,143 acres) would reduce conflicts between mineral leasing and recreation uses, specifically on the trails and roads. Additionally, applying an NSO within 0.5 miles of high use climbing and canyoneering areas could reduce conflicts between recreation and mineral development by reducing visual and noise impacts, which would help maintain the quiet setting relevant to these activities. Protective measures around roads, trails, and climbing locations are not applied in Alternative A.

Applying an NSO stipulation on 46,290 acres of the Canyon Rims SRMA would eliminate impacts related to mineral leasing and development discussed under Alternative A. Applying the Baseline CSU stipulation on the remaining 55,230 acres of this SRMA could reduce some of the noise, traffic, and visual impacts of mineral development, but would not eliminate all potential impacts.

Applying an NSO stipulation on the entire 31,702 acres of the Colorado Riverway SRMA would eliminate impacts discussed under Alternative A.

Applying an NSO stipulation on the entire 2,872 acres of the Dolores River Canyons SRMA would eliminate impacts related to mineral leasing and development discussed under Alternative A.

Applying an NSO stipulation on the entire 76,427 acres of the Indian Creek SRMA would eliminate impacts related to mineral leasing and development discussed under Alternative A.

Applying an NSO stipulation on 54,255 acres of Focus Areas within the Labyrinth Rims/Gemini Bridges SRMA would eliminate impacts related to mineral leasing and development discussed under Alternative A. Applying the Baseline CSU on the remaining 221,533 acres of this SRMA could reduce some of the noise, traffic, and visual impacts of mineral development, but would not eliminate all potential impacts.

Applying an NSO stipulation on 6,990 acres of Focus Areas within the South Moab SRMA would eliminate impacts related to mineral leasing and development discussed under Alternative A. Applying the Baseline CSU on the remaining 16,153 acres of this SRMA could reduce some of the noise, traffic, and visual impacts of mineral development, but would not eliminate all potential impacts.

Applying an NSO stipulation along the Colorado River's suitable WSR segments and closing the Monticello WSR Segment 3 would have the same impacts to recreation as compared to Alternative A.

Applying an NSO stipulation in VRM Class I would have the same impact to recreation as under Alternative A. Applying an NSO stipulation on backways and byways would extend the buffer from 0.5 mile (in Alternative A) to 1 mile, thus increasing the area of protection to 156,067 acres. This stipulation would eliminate most surface disturbance beyond what could be allowed within VRM Class II, managed with a CSU stipulation for backways and byways under Alternative A.

As compared to Alternative A, applying an NSO stipulation on all VRM Class II (324,721 acres), on visual resource inventory (VRI) Class II around Arches and Canyonlands National Parks, and along the Colorado and Green River rims would eliminate all surface disturbance and most noise and dust that could conflict with natural recreation settings. This NSO stipulation allows for no exceptions and would thus protect backcountry and seldom seen locations within VRM II areas. BMPs to reduce night sky impacts would help retain dark skies, providing a more ideal setting for night time star-gazing and improving the visual setting of camping activities throughout the Planning Area.

As compared to Alternative A, BMPs used to mitigate mineral operation noise would decrease impacts to the background setting in many recreation areas. Recreational activities such as non-motorized trail use, especially in backcountry areas away from paved roads, depend upon peace and quiet as part of the ideal setting. Applying an NSO stipulation within 2.5 miles of National Park boundaries could reduce disturbances from mineral development, including noise, but also visual and traffic impacts within this area. Therefore, this stipulation could reduce conflicts with recreation in areas adjoining National Parks.

Impacts Specific to Alternative B1 Only

Not issuing new oil and gas leases within PLAs (103,619 acres) could help to minimize adverse impacts to recreation found within these areas. These adverse impacts could result from concurrent oil and gas development and potash development that could occur under Alternative A. However, 43 percent of the Hatch Point PLA contains existing oil and gas leases. Therefore, there is potential for concurrent development of oil and gas and potash on these existing leases and a greater likelihood for adverse impacts to recreation. Allowing potash leasing and development within PLAs on 103,619 acres could result in impacts to recreation that may be found in these areas from surface-disturbing potash related activities. If the acreage encompassed by PLAs were to become available solely for oil and gas leasing and development the adverse impacts to recreation would be similar to or less than the impacts identified for potash leasing and development. Alternative B1 does not allow potash leasing on 681,948 acres within the Planning Area, which would minimize adverse impacts to recreation from concurrent oil and gas and potash development as compared to Alternative A.

A phased approach to potash leasing could help reduce impacts to recreation as compared to Alternative A. By testing the feasibility of potash development, unnecessary surface disturbance would be avoided and appropriate mitigation measures applied. These measures would benefit recreation.

Designating PLAs (103,619 acres) could reduce the quality of recreation experiences in the Red Wash, Upper Ten Mile, and Hatch Point areas if potash is developed. However, designating these areas would eliminate the possibility of potash development impacts to the recreation settings in the remainder of the Planning Area. Potash wells and infrastructure could conflict with recreation by altering natural viewsheds and increasing traffic, noise, and dust, which could lead to displacement of recreation activities.

Limiting the location of potash processing facilities to PPFAs and locating them largely outside of SRMAs would reduce conflict with most recreation uses as compared to Alternative A. However, some PPFA acreage is located within the Dee Pass Motorized Focus Area within the Labyrinth Rims/Gemini Bridges SRMA. In this Focus Area, the quality of the recreation setting could be reduced by the noise, dust, and visual impacts of facilities.

Designating the 29,127 acre Upper Ten Mile PLA could lead to potash development and infrastructure that would reduce the quality of the recreation settings within the Labyrinth Canyon/Gemini Bridges SRMA since the PLA is entirely within this SRMA. Potash operations, including associated noise, dust, and visual disruptions in the area would be incompatible with recreation in these areas and could displace some

recreation use. However, 7,675 acres of the PLA (26 percent) are managed with an NSO stipulation, which would eliminate these impacts on those acres.

Designating the 29,956 acre Red Wash PLA could lead to potash development and infrastructure that would reduce the quality of the recreation settings within the Labyrinth Canyon/Gemini Bridges SRMA since the PLA is entirely within this SRMA. Potash operations, including associated noise, dust, and visual disruptions in the area would be incompatible with recreation in these areas and could displace some recreation use. However, 13,190 acres of the PLA (44 percent) are managed with an NSO stipulation, which would eliminate these impacts on those acres.

Designating the 45,536 acre Hatch Point PLA could lead to potash development and infrastructure that would reduce the quality of the recreation settings within the Canyon Rims SRMA since the PLA is entirely within this SRMA. Potash operations, including associated noise, dust, and visual disruptions in the area would be incompatible with recreation in these areas and could displace some recreation use. However, 25,885 acres (57 percent) are managed with an NSO stipulation, which would eliminate these impacts.

Under Alternative B1, about 228,926 acres would be open to oil and gas leasing and subject to CSU and TL stipulations (minor constraints). There are zero acres managed as open to oil and gas leasing with standard terms and conditions (open). These areas managed as open and with minor constraints to oil and gas leasing and development comprise about 29 percent of the Planning Area. Within these areas, projected development for oil and gas would occur and the associated surface disturbance could adversely impact recreation. The area managed as open and with minor constraints to oil and gas leasing and development is about 422,344 acres less than Alternative A. Therefore, there is much less likelihood for adverse impacts to recreation associated with oil and gas development in Alternative B1 as compared to Alternative A. About 58 percent of the Planning Area is subject to NSO stipulations (452,269 acres) and closed to oil and gas leasing (753 acres). These major constraints would protect recreation within these areas by precluding surface development. The area covered by major constraints for oil and gas leasing and development is about 313,723 acres more than Alternative A. Therefore, Alternative B1 offers far more protection for recreation from impacts associated with oil and gas leasing and development than Alternative A.

In Alternative B1, about 103,619 acres would be available to potash leasing and development within the PLAs. Within the PLAs, there are about 57,620 acres managed with CSU and TL stipulations (minor constraints) and zero acres managed as open with standard terms and conditions (open). Projected potash well drilling would occur within the PLAs in the areas managed as open and with minor constraints and the associated surface disturbance could adversely impact recreation. The area managed as open and with minor constraints to potash leasing and development is about 593,650 acres less than Alternative A. Therefore, there is much less likelihood for adverse impacts to recreation associated with potash leasing and development in Alternative B1 as compared to Alternative A. In addition, there are about 45,999 acres within the PLAs that are subject to NSO stipulations, which would protect recreation by precluding potash surface development.

Impacts Specific to Alternative B2 Only

In Alternative B2, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would reduce impacts to recreation that would result from the concurrent development of oil and gas and potash as described in Alternative A. The impacts to recreation from the limited potash development provided in Alternative B1 would be greater than the exclusion of potash development in Alterative B2.

Alternative B2 would substitute oil and gas well drilling for potash well drilling within the PLAs established in Alternative B1 and the impacts to recreation would be similar. The major difference between

Alternative B1 and Alternative B2 is that Alternative B2 eliminates the 3,037 acres of surface disturbance and the associated potential adverse impacts to recreation, which could result from the construction of potash processing facilities within the 42,492 acres of PPFAs established in Alternative B1.

In Alternative B2, about 285,806 acres would be open to oil and gas leasing subject to CSU and TL stipulations (minor constraints). There are zero acres managed as open to oil and gas leasing with standard terms and conditions (open). These areas managed as open and with minor constraints to oil and gas leasing and development comprise about 36 percent of the Planning Area. Within these areas, projected development for oil and gas would occur and the associated surface disturbance could adversely impact recreation. The area managed as open and with minor constraints for oil and gas leasing and development is about 365,464 acres less than Alternative A. Therefore, there is much less likelihood for adverse impacts to recreation associated with oil and gas development in Alternative B2 as compared to Alternative A. About 64 percent of the Planning Area is subject to NSO stipulations (499,008 acres) and closed to oil and gas leasing (753 acres). These major constraints would protect recreation within these areas by precluding surface development. The area covered by major constraints for oil and gas leasing and development is about 360,466 acres more than Alternative A. Therefore, Alternative B2 offers far more protection for recreation from impacts associated with oil and gas leasing and development than Alternative A.

4.10.5 Impacts from Alternative C

In Alternative C, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would result in the same impacts to recreation as those described in Alternative B2.

Closing the Three Rivers mineral withdrawal to mineral leasing would eliminate impacts to the viewshed and soundscape of recreational activities along the river, such as boating and camping. Closing these rivers to mineral leasing would preclude drilling from adjacent lands to access the underlying Federal mineral resources. This would minimize the potential impacts that could occur to the viewshed from the rivers. This affords more protection to recreation as compared to Alternatives A and B.

Precluding the use of heavy trucks, with no exceptions, on the Needles Overlook and Anticline Overlook Roads would protect the quality of recreation experiences in and around the Canyon Rims SRMA as compared to Alternatives A and B.

Applying an NSO stipulation on 177,594 acres of designated filming locations would preserve recreational values associated with these areas, such as viewsheds for scenic touring. This provides greater protection to recreation as compared to Alternatives A and B.

Maximizing the size of oil and gas lease parcels would have the same impact to recreation as those described in Alternative B.

The use of BMPs for mineral operations would have the same impact to recreation as those described in Alternative B.

Impacts from applying the Baseline CSU stipulation to lands with wilderness characteristics would have a similar impact to recreation as those described in Alternative B, except 28,240 more acres would be protected by including lands identified subsequent to the 2008 RMP. The Baseline CSU is not applied to SRMAs in Alternative C because SRMAs are all managed with an NSO stipulation (see below).

Increasing the area of the NSO stipulation surrounding developed recreation sites from 0.5 mile (Alternative A) or 1 mile (Alternative B) to 2 miles would increase the protection of recreation settings.

Increasing the area of the NSO stipulation from 0.5 miles (Alternative B) to 1 mile from high use routes would further reduce conflicts between mineral leasing and recreation uses, specifically on the trails and roads. Increasing the area of the NSO stipulation from 0.5 miles to 1 mile of high use climbing and canyoneering areas would further reduce conflicts between recreation and mineral development by reducing visual and noise impacts, which would help maintain the quiet setting relevant to these activities. Protective measures around roads, trails, and climbing locations are not applied in Alternative A and are increased from Alternative B to C.

Applying an NSO stipulation on all 101,520 acres of the Canyon Rims SRMA would eliminate impacts to recreation described in Alternative A. This is an increase of 55,230 acres managed with an NSO stipulation in the Canyon Rims SRMA as compared to Alternative B.

Applying an NSO stipulation on all 31,702 acres of the Colorado Riverway SRMA would have the same impact to recreation as those described in Alternative B.

Applying an NSO stipulation on all 2,872 acres of the Dolores River Canyons SRMA would have the same impact to recreation as those described in Alternative B.

Applying an NSO stipulation on all 76,427 acres of the Indian Creek SRMA would have the same impact to recreation as those described in Alternative B.

Applying an NSO stipulation on all 275,788 acres of the Labyrinth Rims/Gemini Bridges SRMA would eliminate impacts to recreation as those described in Alternative A. This is an increase of 221,533 acres managed with an NSO stipulation in this SRMA as compared to Alternative B.

Applying an NSO stipulation on all 23,143 acres of the South Moab SRMA would eliminate impacts to recreation as those described in Alternative A. This is an increase of 16,153 acres managed with an NSO stipulation in this SRMA as compared to Alternative B.

Closing all suitable WSR segments would eliminate all potential visual and noise impacts that would be incompatible with recreation uses on the river, such as quiet solitude and first class scenery. Closing these suitable WSR segments to mineral leasing would preclude drilling from adjacent lands to access the underlying Federal mineral resources. This would minimize potential impacts that could occur to the viewshed from the suitable WSR segments. This is a greater level of protection than that described in Alternatives A and B.

Closing VRM Class I areas to mineral leasing would have a similar effect on recreation as Alternatives A and B, except noise, traffic, and dust from adjacent areas where horizontal drilling might occur would be eliminated. However, closing VRM I areas to mineral leasing would preclude drilling from adjacent lands to access the underlying Federal mineral resources. This would minimize potential impacts that could occur to the viewshed from the VRM I areas.

Applying an NSO stipulation on backways and byways would be similar to Alternative B, except the area with an NSO stipulation would extend out to 2 miles, increasing the area of protection from 156,067 acres to 267,524 acres.

Applying an NSO stipulation on VRM Class II areas (324,721 acres) would have the same impact as under Alternative B. Closing the immediate viewshed around Arches National Park, applying an NSO stipulation on viewsheds north of the park, and applying a 3 mile buffer along the eastern boundary of Canyonlands National Park and increasing the NSO stipulation along the Colorado and Green River rims out to 2 miles increases the protection of the visual resource values important to natural recreation settings in these areas

as compared to Alternatives A and B. Applying a CSU stipulation to reduce night sky impacts would protect dark skies more than those described under Alternative B and further reduce conflicts with camping and stargazing recreation settings. No provisions to protect night skies were provided in Alternative A.

Impacts from BMPs to mitigate noise would be similar to Alternative B; however, measurable CSU requirements would ensure effective mitigation at desired background noise levels. Impacts from an NSO stipulation for noise near National Parks would be similar to Alternative B, except the area would be extended from 2.5 miles to 2.8 miles from park boundaries.

For Alternative C, about 54,799 acres would be open to oil and gas leasing subject to CSU and TL stipulations (minor constraints). There are zero acres managed as open to oil and gas leasing and development with standard terms and conditions (open). These areas managed as open and with minor constraints comprise about 7 percent of the Planning Area. Within these areas, projected development for oil and gas would occur and the associated surface disturbance could adversely impact recreation. The area managed as open and with minor constraints to oil and gas leasing and development is far less than Alternatives A, B1, and B2. Therefore, there is a much smaller likelihood for adverse impacts to recreation associated with oil and gas development in Alternative C as compared to Alternatives A, B1, and B2. About 93 percent of the Planning Area is subject to NSO stipulations (550,599 acres) and closed to oil and gas leasing (180,169 acres). These major constraints would protect recreation within these areas by precluding surface development. The area covered by major constraints for oil and gas leasing and development is far more than Alternatives A, B1, and B2. Therefore, Alternative C offers far more protection for recreation from impacts associated with oil and gas leasing and development than Alternatives A, B1, and B2.

4.10.6 Impacts from Alternative D

Applying an NSO stipulation along the Colorado River would have the same impact to recreation as those described in Alternatives A and B, but less protection than in Alternative C.

Limiting the use of heavy trucks on the Needles Overlook and Anticline Overlook Roads would have the same impact to recreation as those described in Alternative B, but less protection than in Alternative C. There is no mitigation provided in the use of these roads by heavy trucks in Alternative A.

Applying a CSU stipulation on 177,594 acres of designated filming locations would have the same impact to recreation as those described in Alternative B, but less protection than Alternative C. There is no specific stipulation for filming locations in Alternative A.

Applying the Baseline CSU stipulation to lands with wilderness characteristics analyzed in the 2008 RMPs (192,220 acres) would have the same impact as under Alternative B, but would have far less than those described in Alternative A. The Baseline CSU stipulation would apply to 28,240 fewer acres of land than Alternative C.

Impacts to recreation from maximizing the size of oil and gas lease parcels would be the same as those described in Alternatives B and C.

Using BMPs for mineral operations would have the same impacts to recreation as those described in Alternatives B and C.

Impacts from applying a Baseline CSU stipulation would be similar to Alternative B, although an exception could be granted (Appendix A), which could increase the density of well spacing in some instances. This additional drilling could result in an increased conflict with recreation settings and values as compared with

Alternative B. However, impacts would be less than in Alternative A and more than Alternatives B and C, where the exception does not apply.

Designating PLAs (103,619 acres) would have a similar impact as under Alternative B1, except that a small-scale potash processing facility could be located within the PLAs. This facility could disturb up to 100 acres, which, depending on the location, could reduce the visual quality of recreational settings. However, limiting potash leasing to PLAs would reduce the impacts of potash development to recreation from those described in Alternative A.

Limiting the location of potash processing facilities to PPFAs and locating them largely outside of SRMAs would have the same impacts to recreation as those described in Alternative B1.

Considering phased leasing would have the same impacts to recreation as those described in Alternative B.

Impacts from oil and gas and potash leasing and development are discussed in the sections below specific to Alternatives B1 and B2. However, some specific mineral lease stipulations related to protecting recreation settings and values are applied in Alternative B and would have a direct effect in protecting recreation uses from the impacts of mineral leasing and development. Increasing the NSO around developed recreation sites from 0.5 mile to 1 mile would increase the protection of recreation settings as compared to Alternative A. Applying an NSO stipulation within 0.5 miles of high use routes (95,143 acres) would reduce conflicts between mineral leasing and recreation uses, specifically on the trails and roads. Applying an NSO within 0.5 miles of high use climbing and canyoneering areas could reduce conflicts between recreation and mineral development by reducing visual and noise impacts, which would help maintain the quiet setting relevant to these activities. Protective measures around roads, trails, and climbing locations are not applied in Alternative A.

Impacts to recreation from applying an NSO stipulation to mineral leasing around developed recreation sites of 0.5 mile would be the same as Alternative A; however, an exception could be granted which could create short-term impacts on recreation by allowing some development to proceed as long as there is no long term visual impairment or auditory impacts. This affords less protection to recreation sites than measures described in Alternatives B and C.

Impacts to recreation of applying an NSO stipulation to mineral leasing within 0.5 miles of high use routes (95,143 acres) would be the same as Alternative B. However, an exception could be granted that could create short-term impacts to the foreground by allowing some development to proceed as long as there is no long-term visual impairment or auditory impacts. This measure affords more protection to routes than does Alternative A, but less protection than found in Alternative C.

Impacts to recreation of applying an NSO stipulation to mineral leasing within 0.5 miles of high use climbing and canyoneering would be the same as those described in Alternative B. However, an exception could be granted that could create short-term impacts to the foreground by allowing some development to proceed as long as there is no long term visual impairment or auditory impacts. This affords more protection to routes than does Alternative A, but less protection than found in Alternative C.

The NSO stipulations applied to mineral leasing within SRMAs are the same as described in Alternative B. This would provide more protection than Alternative A, but less than Alternative C.

Applying an NSO stipulation to mineral leasing along the Colorado River and Green River suitable WSR segments and closing the Monticello WSR Segment 3 would have the same impacts as under Alternatives A and B. Alternative D provides less protection than Alternative C.

Closing VRM Class I areas to mineral leasing would have the same impact as under Alternative C and would provide more protection than Alternatives A and B. Applying an NSO stipulation to mineral leasing on backways and byways would have a similar impact as Alternative B. However, an exception could be granted that could create short-term impacts to scenic views along the roads that could reduce the quality of scenic touring opportunities. Alternative D provides more protection than Alternative A, but less than Alternative C.

Applying an NSO stipulation to mineral leasing on VRM Class II (324,721 acres), would have the same impact as under Alternative B. However, an exception to the NSO stipulation in VRM II areas may be allowed that could lead to adverse impacts to visual resources especially in the seldom seen backcountry areas. These impacts would affect those recreationists seeking a backcountry experience away from the majority of visitors.

Closing the immediate viewshed around Arches National Park would have the same impacts to recreations as those described in Alternative C. However, the extended viewshed north of Arches National Park would not be managed with an NSO stipulation. Therefore, Alternative D affords less protection for recreation around Arches National Park than does Alternative C, but more than Alternatives A and B.

BMPs to reduce night sky impacts would have the same impact to recreation as those describe in Alternative B, but less protection than the CSU stipulation applied for night skies in Alternative C. Night skies mitigation is not provided in Alternative A. BMPs to mitigate noise would have the same impact as Alternative C. Applying an NSO stipulation for noise within 2.5 miles of National Park boundaries would have the same impact to recreation as those described in Alternative B, but less than the 2.8 miles of NSO applied in Alternative C. Noise mitigation is not provided in Alternative A.

Under Alternative D, about 230,765 acres would be open to oil and gas leasing subject to CSU and TL stipulations (minor constraints). There are zero acres managed as open to oil and gas leasing with standard terms and conditions (open). These areas managed as open and with minor constraints to oil and gas leasing and development comprise about 29 percent of the Planning Area. Within these areas, projected development for oil and gas would occur and the associated surface disturbance could adversely impact recreation. The area managed as open and with minor constraints to oil and gas leasing and development in Alternative D is about 420,505 acres less than Alternative A. Therefore, there is much less likelihood for adverse impacts to recreation associated with oil and gas leasing and development in Alternative D as compared to Alternative A; a similar likelihood for adverse impacts as compared to Alternatives B1 and B2; and a greater likelihood for adverse impacts as compared to Alternative C.

About 57 percent of the Planning Area is subject to NSO stipulations (305,899 acres) and closed to oil and gas leasing (145,284 acres). These major constraints would protect recreation within these areas by precluding development. The area covered by major constraints for oil and gas leasing and development is about 311,888 acres more than Alternative A; slightly less (1,839 acres) than Alternative B1, less than (48,578 acres) Alternative B2; and much less than (279,585 acres) than Alternative C. Therefore, Alternative D offers far more protection for recreation from impacts associated with oil and gas leasing and development than Alternative A; similar protection than Alternatives B1 and B2; and much less than Alternative C.

Under Alternative D, about 103,619 acres would be available to potash leasing and development within the PLAs. Within the PLAs, there are about 57,620 acres are open to potash leasing and development subject to CSU and TL stipulations and zero acres open under standard terms and conditions. Projected potash well drilling would occur within these areas subject to CSU and TL stipulations; the associated surface disturbance could adversely impact recreation. The area available for potash leasing and development is about 593,650 acres less than Alternative A and the same as Alternative B1. Therefore, there is much less

likelihood for adverse impacts to recreation associated with potash development in Alternative D as compared to Alternative A. In addition, out of the 103,619 acres available for potash leasing, there about 45,999 acres that are subject to NSO stipulations, which would protect recreation by precluding potash surface development. In Alternatives B2 and C, no leasing and development of potash would occur.

4.11 RIPARIAN RESOURCES

This section presents potential impacts to riparian resources from implementing management actions presented in Chapter 2. Existing conditions concerning riparian resources management are described in Chapter 3. Riparian resources are protected by an NSO stipulation across all alternatives, which vary by alternative in the amount of buffer distance surrounding the habitat and the overall acreage protected. Because of this protection, impacts to riparian resources would most often be indirect with most impacts occurring from soil erosion and runoff from adjacent or nearby mineral development.

4.11.1 Assumptions

- The degree of impact attributed to any one disturbance or series of disturbances would be influenced by several factors, including location in the watershed; the type, time, and degree of disturbance; existing vegetation; precipitation; and mitigating actions applied to the disturbance.

- Current trends in plant succession and vegetation health would continue.

- Where assessments for rangeland health standards have been conducted, riparian plant communities are functioning properly or are in the process of achieving proper functioning condition (PFC).

- Noxious and invasive weeds would continue to be introduced and spread as a result of ongoing vehicle traffic in and out of the Planning Area, recreational activities, wildlife and livestock grazing and movements, and surface-disturbing activities.

- Weed and pest control would be carried out in coordination with the appropriate County weed and pest control district and owners of adjacent property.

4.11.2 Impacts Common to All Alternatives

The following discussions represent impacts on riparian habitat that would not vary by alternative.

Management to support air quality and the use of dust abatement measures could protect riparian areas from dust accumulation on foliage, reduce runoff of sediment or siltation within aquatic systems, and could reduce airborne pollutants or particulate matter that could damage riparian vegetation.

Closing the Monticello WSR Segment 3 to mineral leasing (753 acres) would prevent surface disturbance from leasing and development activities and protect adjacent riparian habitat from degradation or damage from erosion and runoff. The closure to future leasing and development activities would protect riparian vegetation, support in-channel structure and streambanks, and support water quality. The prevention of surface disturbance could reduce the potential for the introduction and spread of invasive, non-native plant species, providing additional protection to downstream riparian vegetation and corridor function.

Management to protect special status species, wildlife, and associated riparian habitat would indirectly protect riparian areas from surface-disturbing activities from buffer distances, NSO stipulations, or CSU and TL stipulations applied either seasonally or throughout the year. Any reduction or prevention of surface disturbance would protect riparian vegetation from damage or removal, prevent soil erosion, runoff, sediment deposition and loss of streambanks; prevent or reduce the spread of invasive, non-native plant species, and could protect water quality.

4.11.3 Impacts from Alternative A (No Action)

Applying an NSO stipulation for oil and gas leasing within the existing Three Rivers mineral withdrawal for locatable minerals would provide greater protection to the riparian resources within the withdrawal area by preventing surface disturbance and possible riparian vegetation loss from oil and gas development. The NSO stipulation could prevent soil loss, erosion, runoff, or damage of streambanks; could prevent the loss or damage to riparian vegetation; and could prevent or reduce the introduction and spread of invasive, non-native plant species. The stipulation could provide protection to downstream riparian habitat and support water quality within the Green River and Colorado River corridors.

Under Alternative A, both oil and gas leasing and potash leasing could occur concurrently on the same tract of land, which could result in higher concentrations of development and redundant infrastructure. Although drilling for oil and gas and potash is similar, the production of potash requires the use of potash processing facilities, which involves large tracts of land over a long period of time. Any area where oil, gas or potash leasing and development occurs would experience surface disturbance, soil loss and runoff. If development were to occur adjacent to a riparian area, runoff could lead to streambank erosion, vegetation loss, sediment loading, and stream channel alteration. Mineral development could increase the potential for the introduction and spread of invasive, non-native plant species, which could lead to loss of native riparian vegetation, reduced water quality and stream channel alteration.

Allowing oil and gas leasing subject to standard lease terms and conditions could result in surface disturbance and removal of vegetation from the development of well pads and associated infrastructure within the 210,884 acres of open to leasing with standard terms and conditions (open) (Table 4-19). Runoff from development could lead to streambank erosion, vegetation loss, sediment loading, and stream channel alteration. Invasive, non-native plant species could be introduced and spread by vehicles and machinery during development activities and spread to nearby riparian areas, which could lead to loss of native riparian vegetation, reduced water quality, and stream channel alteration.

Applying CSU and TL stipulations to oil and gas leasing could reduce surface disturbance within 440,386 acres (Table 4-19). Timing limitation stipulations would prevent surface disturbance during specific timeframes, which could reduce the risk of runoff and erosion during the periods of closure; however, disturbance and vegetation removal could still occur outside of the seasonal closures. Applying CSU stipulations could reduce disturbance to steep slopes, scenic driving corridors, and VRM II areas, minimizing erosion, runoff, and the introduction and spread of invasive, non-native plant species into nearby riparian areas.

Applying an NSO stipulation for leasing would prevent surface-disturbing activities from oil and gas development within the 133,574 acres (Table 4-19). The NSO stipulation would prevent surface disturbance from mineral development, and reduce the risk of erosion and runoff into riparian areas within or adjacent to the protected areas. Reducing runoff and erosion would protect riparian vegetation, support in-channel structure, streambanks, and support water quality. The prevention of surface disturbance could reduce the potential for the introduction and spread of invasive, non-native plant species, providing additional protection to nearby riparian vegetation and functioning condition.

Closing 753 acres to oil and gas leasing (Monticello WSR Segment 3) would prevent surface disturbance from development activities, and protect adjacent riparian habitat from degradation or damage from erosion and runoff. Precluding oil and gas development would protect riparian vegetation, support in-channel structure, streambanks, and support water quality. The prevention of surface disturbance could reduce the potential for the introduction and spread of invasive, non-native plant species, providing additional protection to nearby riparian vegetation and functioning condition.

Table 4-19. Oil and Gas Management Category for Riparian Resources by Alternative

Management Category	Alternative A		Alternative B1 and B2			Alternative C		Alternative D	
	Total Acres	Riparian Acres	Total Acres		Riparian Acres	Total Acres	Riparian Acres	Total Acres	Riparian Acres
Open	210,884	2,015	**B1**	0	0	0	0	0	0
			B2	0	0				
CSU/TL	440,386	5,470	**B1**	228,926	0	54,799	0	230,765	0
			B2	285,806	0				
NSO	133,574	4,638	**B1**	452,269	11,040	550,599	7,584	305,899	9,243
			B2	499,008	12,123				
Closed	753	94	**B1**	753	94	180,169	4,633	145,284	1,891
			B2	753	94				

Note: Riparian acreage in Alternatives B1 and D does not include 1,183 riparian acres within PLAs.

Under Alternative A, impacts from potash well drilling on riparian resources would be the same as described for the areas managed for oil and gas leasing as open with standard terms and conditions, the application of lease stipulations of CSU, TL, and NSO, and closing lands to mineral development (Table 4-20).

Table 4-20. Potash Management Categories by Alternative

Management Category	Alternative A (acres)	Alternative B1 (acres)	Alternative B2 (acres)	Alternative C (acres)	Alternative D (acres)
Open	210,884	0	0	0	0
CSU/TL	440,386	57,620	0	0	57,308
NSO	133,574	45,999	0	0	46,311
Closed	753	0	785,567	785,567	0
Deferred (outside PLAs)	0	681,948	NA	NA	681,948
Total Acres	**785,567**	**785,567**	**785,567**	**785,567**	**785,567**

Potash processing facilities could be developed where existing stipulations do not preclude surface disturbance (NSO and closed). This means that potash processing facilities could be constructed in the 210,884 acres of open to leasing with standards terms and conditions (open) areas or possibly within the 440,386 acres of lands with CSU and TL stipulations. Development of processing facilities could result in surface disturbance and removal of vegetation. Runoff from development into adjacent riparian areas could lead to streambank erosion, vegetation loss, sediment loading, and stream channel alteration. Invasive, non-native plant species could be introduced and spread by vehicles and machinery during development activities and spread to adjacent riparian areas, which could lead to loss of native riparian vegetation, reduced water quality and stream channel alteration.

Applying a TL stipulation for mineral leasing (for both oil and gas and potash) prohibiting surface-disturbing activities on saline soils within 68,275 acres from December 1 to May 31 could reduce soil loss and erosion, and prevent saline runoff into adjacent riparian areas during the winter and spring.

Management for salinity control, sensitive soils, drought management, and applying BMPs to all oil and gas authorizations in accordance to WO IM 2007-021 and the most current version of the *Gold Book* could reduce or prevent erosion or runoff of saline or other undesirable soils into riparian areas and reduce degradation of riparian systems in areas adjacent to development activities.

Applying mineral leasing stipulations for steep slopes (Table 4-21) could reduce or prevent surface disturbance and associated runoff from areas very prone to heavy runoff during precipitation. Additional erosion control plans could reduce runoff in areas where development occurs. This management could help reduce damage to adjacent riparian systems and help protect riparian vegetation, support in-channel structure and streambanks, and support water quality.

Table 4-21. Mineral Leasing Stipulations for Steep Slopes by Alternative

Stipulation	Alternative A		Alternative B		Alternative C		Alternative D	
	Slope %	Acres	Slope %	Acres	Slope %	Acres	Slope %	Acres
CSU	Moab >30%	79,045	>21 %	181,119	21-30%	46,525	>21 %	181,119
	Monticello 21-40%	29,150						
NSO	Monticello >40%	42,339	-	-	>30%	134,594	-	-
Total Acres	150,534		181,119		181,119		181,119	

Applying an NSO stipulation within public water reserves, 100-year floodplains, within 330 feet of riparian areas, springs, and other water resources (50,495 acres), and suitable WSR segments (19,347 acres), would prevent surface disturbance and loss of riparian vegetation from mineral development, and reduce the risk of erosion and runoff into riparian areas. Reducing runoff and erosion would protect riparian vegetation, support in-channel structure and streambanks, and support water quality. The prevention of surface disturbance could reduce the potential for the introduction and spread of invasive, non-native plant species, providing additional protection to nearby riparian vegetation and functioning condition.

The use of native seed mixes for restoration and rehabilitation would support the growth of native vegetation communities within riparian areas when areas have been rehabilitated. Use of non-native species could help stabilize soils and prevent erosion in the short term, providing support to streambanks and floodplains, and, over the long term, could provide stable substrate for native species to then re-establish. Preventing the infestation and spread of noxious weeds or controlling noxious weed species would support the health and vitality of riparian ecosystems, provide protection to nearby riparian vegetation, and support overall functioning condition.

4.11.4 Impacts from Alternative B

Impacts to riparian resources from applying an NSO stipulation for oil and gas leasing within the existing Three Rivers mineral withdrawal would be the same as described under Alternative A.

Under Alternative B, maximizing oil and gas lease size and applying the Baseline CSU stipulation to sensitive resource would result in reducing or eliminating redundant infrastructure from oil and gas development. This management could reduce the amount of disturbance from development activities, which could minimize runoff, erosion and damage to riparian systems.

Applying the Baseline CSU stipulation for all mineral development (208,185 acres in Alternative B1 and 222,289 acres in Alternative B2) could reduce surface disturbance when compared to Alternative A, which primarily consists of timing restrictions. The Baseline CSU stipulation could reduce the density of disturbance and support reclamation and mitigation activities when development does occur. The Baseline CSU could reduce or minimize surface disturbance from mineral development, and reduce erosion and runoff into riparian areas within or adjacent to the protected areas. Reducing runoff and erosion could protect riparian vegetation, reduce damage to in-channel structure and streambanks, and support water quality. The CSU could reduce the introduction and spread of invasive, non-native plant species, providing additional protection to nearby riparian vegetation and functioning condition. Reclamation of disturbance could reduce additional runoff, minimize erosion, and support the heath of adjacent riparian resources.

Applying BMPs, as appropriate, to mineral operations (oil and gas and potash) could provide greater protection to riparian resources; prevent the establishment or spread of invasive, non-native plant species; and provide direct protection to riparian resources as compared to Alternative A. The BMPs could reduce runoff of pollutants, salts, or other soils, prevent erosion of sediment into riparian ecosystems, protect water quality, prevent damage to riparian areas from vehicles and stream crossings, and provide prevention and eradication measures for invasive, non-native plant species. Use of the BMPs would support riparian vegetation, reduce damage to in-channel structure and streambanks, and support water quality.

Applying a CSU stipulation to mineral leasing for offsite reclamation in areas of saline soils could provide soil stability and help reduce soil erosion and runoff into riparian habitat if reclamation efforts were successful. Applying a CSU stipulation for steep slopes over 21 percent (Table 4-21) could reduce or prevent surface disturbance and associated runoff from areas prone to heavy runoff during precipitation to a greater degree as compared to Alternative A (181,119 acres). Erosion control plans could reduce runoff in areas where development occurs. This management could help reduce damage to adjacent riparian systems and help protect riparian vegetation, support in-channel structure and streambanks, and support water quality.

Applying an NSO stipulation to preclude mineral activities within public water reserves, 100-year floodplains, within 500 feet of intermittent and perennial streams, rivers, riparian areas, wetlands, water wells, lakes, and springs (69,786 acres), and within 100 feet of ephemeral streams would provide greater protection for riparian resources as compared to Alternative A, with larger buffer distances (170 feet larger) and additional riparian areas (a total of 75,907 more acres). Applying an NSO stipulation to preclude mineral activities within 750 feet of the Colorado River and Fisher Creek (4,590 acres) would allow for additional protection of riparian habitat in these areas. The NSO stipulation would directly protect the riparian resources, by preventing vegetation loss, streambank erosion, diminished water quality, and damage to floodplains. The NSO stipulation could also prevent the infestation and spread of invasive, non-native plant species, provide protection to nearby riparian vegetation, and support overall functioning condition.

Measures to protect water quality in aquifers and watersheds from mineral development include applying a CSU stipulation to important spring areas requiring a hydrologic assessment prior to conducting any mineral operations (38,056 acres); applying the Baseline CSU stipulation to the Courthouse Wash Watershed (51,790 acres); and applying a CSU stipulation requiring closed loop drilling and other operational constraints to this watershed; applying the Baseline CSU stipulation to the Salt Wash Watershed (61,925 acres) along with a CSU stipulation requiring closed loop drilling and other operational constraints,

and applying BMPs for the protection of shallow and potential unconsolidated aquifers. This management could protect water quality and support the health of related riparian habitat within or adjacent to the watersheds. Alternative A does not address these water resources.

Impacts to riparian resources from applying an NSO stipulation to the suitable WSR segments along the Colorado and Green Rivers with the exception of Colorado River Segment 3 in Monticello (19,347 acres) would be the same as described under Alternative A.

The use of BMPs for reclamation, soils, and noxious weed prevention and control would provide greater protection to riparian resources as compared to Alternative A, due to the availability of the BMPs to be applied to all leases as appropriate. Impacts to riparian resources from the use of native plant species and control of noxious weeds would be similar to Alternative A, although management from the BMPs would be consistently used and would provide greater support to the health and vitality of riparian resources.

Impacts Specific to Alternative B1 Only

Not issuing new oil and gas leases within PLAs (103,619 acres) could help to minimize adverse impacts to riparian resources by limiting the amount of surface disturbance within the PLAs. These adverse impacts could result from the concurrent oil and gas development and potash development, which could occur under Alternative A. However, 43 percent of the Hatch Point PLA contains existing oil and gas leases. Therefore, there is potential for concurrent development of oil and gas and potash on these existing leases and a greater likelihood for adverse impacts to riparian resources over the next 15 years in the Hatch Point PLA. Furthermore, if potash resources do not develop in that time frame, the area could again be available for oil and gas leasing. If the acreage encompassed by PLAs were to become available solely for oil and gas leasing and development the adverse impacts to riparian resources would be similar to or less than the impacts identified for potash leasing and development. Alternative B1 does not allow potash leasing on 681,948 acres within the Planning Area, which would minimize adverse impacts to riparian resources from concurrent oil and gas and potash development as compared to Alternative A.

A phased approach to potash leasing could help reduce impacts to soil resources as compared to Alternative A. By testing the feasibility of potash development, unnecessary surface disturbance would be avoided and appropriate mitigation measures applied. These measures would benefit riparian resources.

Not issuing oil and gas leases within PLAs (103,619 acres) could reduce the density of surface disturbance within the PLAs, resulting in less damage or removal of vegetation and could reduce erosion and runoff into riparian areas. Reducing runoff and erosion could protect riparian vegetation, reduce damage to in-channel structure and streambanks, and support water quality.

Applying a CSU stipulation to all potash leases that requires processing facilities to be located within a PPFA within 42,492 acres would localize the disturbance and infrastructure within the PPFAs and prevent large-scale disturbance from potash processing in other areas in the Planning Area. In Alternative A, potash processing facilities could occur anywhere within 210,884 acres of open areas and possibly 440,386 acres of lands with CSU and TL stipulations. Limiting the area available for PPFAs in Alternative B1 could reduce erosion and runoff into riparian areas as compared to Alternative A. Reducing runoff and erosion could protect riparian vegetation, reduce damage to in-channel structure and streambanks, and support water quality. In addition, more facilities are expected in Alternative A, which would disturb 1,179 more acres of soil than that expected in Alternative B1 (from 4,216 acres of disturbance in Alternative A to 3,037 acres of disturbance in Alternative B1).

Under Alternative B1, there are zero acres open to oil and gas and potash leasing with standard terms and conditions as compared with the 210,884 acres in Alternative A. Alternative B1 could result in less runoff and damage to riparian habitat as compared to Alternative A (Table 4-19 and Table 4-20).

Applying CSU and TL stipulations to oil and gas leasing could reduce surface disturbance within 228,926 acres (Table 4-19). Applying CSU stipulations, which includes the Baseline CSU stipulation, could minimize density of disturbance, reduce conflicts of development, and support reclamation and mitigation activities when development does occur. These CSU stipulations could reduce runoff and erosion to adjacent or nearby riparian resources, protecting riparian vegetation, reducing damage to in-channel structure and streambanks, and supporting water quality.

Applying an NSO stipulation for oil and gas leasing would prevent surface-disturbing activities from oil and gas development within 452,269 acres (Table 4-19), 318,695 more acres as compared to Alternative A. The NSO stipulation would prevent surface disturbance from oil and gas development, and reduce the risk of erosion and runoff into riparian areas within or adjacent to the protected areas. Reducing runoff and erosion would protect riparian vegetation, support in-channel structure, streambanks, and support water quality. The prevention of surface disturbance could reduce the potential for the introduction and spread of invasive, non-native plant species, providing additional protection to nearby riparian vegetation and functioning condition.

Impacts to riparian resources from closing 753 acres to oil and gas leasing would be the same as described under Alternative A.

Potash leasing would only be permitted within the PLAs (103,619 acres), with 57,620 of these acres available for potash leasing with CSU and TL stipulations, and the remaining 45,999 acres available with NSO stipulations (Table 4-20). Impacts to riparian resources from potash leasing and associated well drilling would be similar to the impacts from oil and gas leasing and well drilling.

In Alternative B1, approximately 681,948 acres are deferred for potash leasing and development as compared to Alternative A, where 651,240 acres are open with standard terms and conditions (open) and with minor constraints (CSU and TL stipulations). Therefore, Alternative B1 provides far less acreage (593,620 acres) managed as open and with minor constraints than does Alternative A. The area deferred for potash leasing in Alternative B1 would prevent surface disturbance from leasing activities, which would help to prevent erosion and runoff into adjacent or nearby riparian areas, as well as preventing the introduction and spread of invasive, non-native plant species from machinery and vehicles. Thus, these measures could provide additional protection to nearby riparian vegetation and functioning condition.

Under Alternative B1, the TL stipulation for mineral leasing to prohibit surface-disturbing activities on saline soils would only apply within 49,915 acres as compared to 68,275 acres in Alternative A. The TL stipulation would not apply within the PPFAs in Alternative B1, which could result in erosion and runoff of saline soils into nearby riparian areas; however, an additional CSU stipulation for the PPFAs would require offsite mitigation of any disturbance of saline soils within these areas (18,360 acres). Offsite mitigation could eventually provide soil stability and reduced erosion where rehabilitation efforts are successful.

Impacts Specific to Alternative B2 Only

In Alternative B2, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would reduce impacts to riparian resources that would result from the concurrent development of oil and gas and potash as described in Alternative A. The impacts to riparian resources from the limited potash development provided in Alternative B1 would be greater than the exclusion of potash development in Alterative B2.

Alternative B2 would substitute oil and gas well drilling for potash well drilling within the PLAs established in Alternative B1 and the impacts to riparian resources would be similar. The major difference between

Alternative B1 and Alternative B2 is that Alternative B2 eliminates the 3,037 acres of surface disturbance, and the associated potential adverse impacts to riparian resources that could result from the construction of potash processing facilities within the 42,492 acres of PPFAs established in Alternative B1.

Managing the entire Planning Area as open only for oil and gas leasing (closed to potash leasing) would prevent surface disturbance from potash leasing and development and could reduce soil loss from potash drilling operations, processing facilities and associated infrastructure. Less surface disturbance would reduce the overall impacts from leasing activities and prevent erosion, runoff, and damage to riparian resources (Table 4-19).

Under Alternative B2, there are zero acres open to oil and gas leasing with standard terms and conditions as compared to 210,884 in Alternative A. Therefore, Alternative B2 could result in less runoff, erosion or damage to riparian areas as compared to Alternative A.

Applying CSU and TL stipulations to oil and gas leasing could reduce or minimize surface disturbance from oil and gas development within 285,806 acres (Table 4-19), 154,580 fewer acres than Alternative A. Impacts to riparian habitat would be similar to those described in Alternative B1 and less than Alternative A.

Applying an NSO stipulation for oil and gas leasing would prevent surface-disturbing activities from oil and gas development within 499,008 acres (Table 4-19), 365,434 more acres as compared to Alternative A. Impacts to riparian habitat would be similar to those described under Alternative B1 and less than Alternative A.

Impacts to riparian resources from closing 753 acres to oil and gas leasing would be the same as described under Alternative A.

Impacts to riparian resources from applying a TL stipulation to saline soils would be the same as those described in Alternative A.

4.11.5 Impacts from Alternative C

In Alternative C, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would result in the same impacts to riparian resources as those described in Alternative B2.

Closing the existing Three Rivers mineral withdrawal to mineral leasing would provide the greatest protection to the riparian resources within the area compared to Alternatives A and B. The closure would provide greater protection by limiting development from adjacent lands and by preventing surface disturbance. Closing the area would prevent soil loss, erosion, runoff, or damage of streambanks, prevent the loss or damage to riparian vegetation; and prevent the introduction and spread of invasive, non-native plant species. This management would provide protection to downstream riparian habitat and support water quality within the Colorado River and Green River corridors.

Impacts to riparian resources from managing the entire Planning Area (785,567 acres) as open only for oil and gas leasing (closed to potash leasing) would be the same as those described in Alternative B2.

Impacts to riparian resources from maximizing oil and gas lease size and thus reducing or eliminating redundant infrastructure from oil and gas development would be the same as those described in Alternative B.

Applying the Baseline CSU stipulation for oil and gas leasing and development for sensitive resources, could reduce surface disturbance when compared to Alternative A, where existing minor stipulations primarily consist of timing restrictions. Impacts to riparian resources would be similar to those described in Alternatives B1 and B2.

Under Alternative C, as in Alternatives B1 and B2, there are zero acres open to oil and gas and potash leasing with standard terms and conditions as compared with the 210,884 acres in Alternative A. Therefore, Alternative C could reduce erosion and runoff into nearby riparian habitat as compared to Alternative A.

Alternative C applies CSU and TL stipulations to oil and gas leasing on 54,799 acres, which is much less acreage than Alternatives A and B. While Alternative C has fewer acres that are managed with a CSU or TL stipulation, these acres are managed more restrictively (NSO and closed). Thus, Alternative C provides more protection to riparian resources than Alternatives A and B.

Applying an NSO stipulation in Alternative C for oil and gas leasing could prevent surface-disturbing activities from oil and gas development within 550,599 acres (Table 4-19), which is 412,496 more acres as compared to Alternative A and 51,511 acres more than Alternatives B1 and B2. Impacts to riparian resources would be similar to those described under Alternatives A, B1, and B2 but would apply to a much larger area and would protect riparian vegetation, support in-channel structure and streambanks, and support water quality.

Under Alternative C, closing 180,169 acres to oil and gas leasing and development would preclude surface disturbance on 179,416 more acres than Alternatives A, B1, and B2. Impacts to riparian resources would be similar to those described under Alternatives A, B1, and B2 but would apply to far more acres of riparian habitat.

Impacts to riparian resources from applying a TL stipulation to saline soils in Alternative C would be the same as those described in Alternatives A and B.

Impacts to riparian resources from applying a CSU stipulation in Alternative C for offsite reclamation for areas of saline soils would be the same as those described in Alternative B. There is no requirement for offsite reclamation in Alternative A.

Applying a CSU stipulation on slopes between 21 percent and 30 percent (Table 4-21) in Alternative C could reduce or prevent surface disturbance and associated runoff from areas prone to heavy runoff during precipitation (46,525 acres). Erosion control plans could reduce runoff in areas where development occurs. This management could help reduce damage to adjacent riparian systems and help protect riparian vegetation, support in-channel structure and streambanks, and support water quality. Applying an NSO to slopes over 30 percent in Alternative C would provide protection to areas with potential for heavy runoff when disturbed and prevent erosion, runoff and sediment from entering nearby riparian resources. This management could help reduce damage to adjacent riparian systems and help protect riparian vegetation, support in-channel structure and streambanks, and support water quality.

Applying an NSO stipulation in Alternative C to preclude mineral activities within public water reserves, 100-year floodplains and within 650 feet of intermittent and perennial streams, rivers, riparian areas, wetlands, water wells, lakes, and springs (91,558 acres), and within 200 feet of ephemeral streams provides the greatest protection for riparian resources as compared to Alternatives A and B, with larger buffer distances around water sources and associated riparian vegetation. Alternative C protects 41,063 more acres than Alternative A and 21,772 more acres than Alternative B.

Applying an NSO stipulation for impaired water bodies to preclude mineral activities within 1,000 feet of the Colorado River and Fisher Creek (6,883 acres) would allow for additional protection of riparian habitat in these areas, 2,293 more acres compared to Alternative B. The NSO stipulation would directly protect the riparian resources, by preventing vegetation loss, streambank erosion, diminished water quality, and damage to floodplains. The NSO stipulation could also prevent the infestation and spread of invasive, non-native plant species, provide protection to nearby riparian vegetation, and support overall functioning condition. Impaired water bodies were not specifically addressed in Alternative A.

Applying an NSO stipulation to important spring areas, the Courthouse Wash Watershed (51,790 acres), and the Salt Wash Watershed (61,925 acres) in Alternative C would protect water quality and support the health of related riparian habitat within or adjacent to the watersheds. Alternative C with these NSO stipulations provides greater protection than the CSU stipulation provided in Alternative B. Alternative A does not specifically address important spring areas and the Courthouse and Salt Wash Watersheds.

Closing suitable WSR segments along the Colorado and Green Rivers to mineral leasing (19,347 acres) would prevent surface disturbance from leasing activities and protect adjacent riparian habitat from degradation or damage from erosion and runoff. The closure to future leasing activities would protect riparian vegetation, support in-channel structure and streambanks, and support water quality. The prevention of surface disturbance could reduce the potential for the introduction and spread of invasive, non-native plant species, providing additional protection to nearby riparian vegetation and functioning condition.

Impacts to riparian resources from applying BMPs for oil and gas leasing and development would be the same as those described in Alternative B.

Impacts to riparian resources from applying a TL stipulation to saline soils would be the same as those described in Alternative A.

4.11.6 Impacts from Alternative D

Impacts to riparian resources from applying an NSO stipulation for the Three Rivers mineral withdrawal would be the same as those described in Alternatives A and B.

Impacts to riparian resources from maximizing lease size and thus reducing or eliminating redundant infrastructure from oil and gas development would be the same as those described in Alternatives B and C.

Impacts to riparian resources from not issuing oil and gas leases within PLAs (103,619 acres) would be the same as those described in Alternative B1.

Impacts to riparian resources from applying a CSU stipulation to all potash leases that requires processing facilities to be located within a PPFA (42,492 acres) would be similar to Alternative B1; however, an exception could allow for a small-scale potash processing facility within the PLAs, allowing an additional disturbance of up to 100 acres. If the smaller potash processing facility were to be developed, surface disturbance could lead to erosion and runoff into nearby riparian areas. There also could be a greater risk of the introduction and spread of invasive, non-native plant species.

Applying the Baseline CSU stipulation for all mineral development on 213,218 acres could reduce surface disturbance when compared to Alternative A, which primarily consists of timing limitations. Impacts to riparian resources from the Baseline CSU stipulation would be very similar to Alternatives B1 and B2.

Alternative D provides exceptions to some of the mineral stipulations, including an NSO stipulation to protect visual resources, the Baseline CSU stipulation, and the CSU stipulation for potash leases that would allow small-scale potash processing facilities within PLAs. These exceptions could lead to possibly more surface disturbance, erosion, runoff, and degradation of nearby riparian resources than that provided in Alternative B1.

Under Alternative D, as in Alternatives B1, B2, and C there are zero acres managed as open with standard terms and conditions to oil and gas and potash leasing with standard terms and conditions as compared with the 210,884 acres in Alternative A. Therefore, Alternative D could reduce or prevent surface-disturbing activities from oil and gas and potash development throughout these acres compared to Alternative A (Table 4-19 and Table 4-20).

Applying CSU and TL stipulations in Alternative D to oil and gas leasing on 230,675 acres would result in similar impacts to riparian resources as those described in Alternatives B1 and B2. While Alternative D has 209,781 fewer acres than Alternative A that are managed with a CSU or TL stipulation, all of these acres are managed more restrictively (NSO and closed) in Alternative D. Thus, Alternative D provides more protection to riparian resources than does Alternative A. While Alternative D has 175,966 more acres than Alternative C that are managed with a CSU or TL stipulation, the majority of these acres are managed more restrictively in Alternative C. Thus, Alternative C provides more protection to riparian resources than does Alternative D.

Applying an NSO stipulation for mineral leasing could prevent surface-disturbing activities from oil and gas leasing within 305,899 acres (Table 4-19), which is 172,325 more acres as compared to Alternative A, but 245,700 acres fewer than Alternative C. While Alternatives B1 and B2 manage 146,390 more acres with an NSO stipulation as opposed to Alternative D, the majority of these 146,390 acres are managed as closed in Alternative D. Thus, Alternative D provides more protection to riparian resources than do Alternatives A, B1, and B2, but less protection than Alternative C.

Closing 145,284 acres to oil and gas leasing in Alternative D, 144,531 more acres than Alternatives A and B, would prevent surface disturbance from development activities, and directly protect adjacent riparian habitat from degradation or damage from erosion and runoff. The closure to future leasing activities would protect riparian vegetation, support in-channel structure and streambanks, and support water quality. The prevention of surface disturbance would reduce the potential for the introduction and spread of invasive, non-native plant species, providing additional protection to nearby riparian vegetation and functioning condition. The acreage closed in Alternative D is 34,885 fewer acres than Alternative C. Therefore, Alternative C provides the most protection to riparian resources.

In Alternative D, potash leasing would only be permitted within the PLAs (103,619 acres), with 57,308 of these acres available for potash leasing with CSU and TL stipulations, and the remaining 45,311 acres available with NSO stipulations (Table 4-20). Impacts to riparian resources from well drilling within PLAs would be similar to those impacts from oil and gas well drilling. Impacts to riparian resources from potash leasing and development would be similar to those described in Alternative B1, with only slight changes in acres protected by lease stipulations.

In Alternative D, impacts to riparian resources from the approximately 681,948 acres deferred to potash leasing and development are the same as those described in Alternative B1. Alternatives B2 and C provide the greatest protection to riparian resources from potash leasing and development because the entire Planning Area is closed to potash leasing. Alternative A provides the least protection to riparian areas from potash leasing and development because outside of closed areas (753 acres) most of the Planning Area (650,240 acres) is available for potash leasing as open with standard terms and conditions and with minor constraints (CSU and TL stipulations).

In Alternative D, indirect impacts to riparian resources from the management of saline soils would be the same as those described under Alternative B1, which applies a TL stipulation to 49,915 acres. Alternatives A, B2, and C apply the TL stipulation to 68,275 acres of saline soils providing greater protection to adjacent riparian resources.

Impacts to riparian resources from applying a CSU stipulation in Alternative D for offsite reclamation for areas of saline soils within PPFAs, would be the same as those described in Alternative B1.

Impacts to riparian resources from applying a CSU stipulation for slopes over 21 percent would be the same as those described in Alternative B.

Impacts to riparian resources from applying an NSO stipulation to preclude mineral activities within public water reserves, 100-year floodplains and within 500 feet of intermittent and perennial streams, rivers, riparian areas, wetlands, water wells, lakes, and springs (69,786 acres) and ephemeral streams, as well as applying an NSO stipulation to preclude mineral activities within 750 feet of the Colorado River and Fisher Creek (4,590 acres) would be the same as those described under Alternative B. In Alternative D, impacts to riparian resources from applying an NSO stipulation would be greater than those described in Alternative C (91,558 acres) because more acreage is protected with an NSO stipulation. However, Alternative D provides more protection to riparian resources, which protects 50,495 acres with an NSO stipulation.

Impacts to riparian resources from applying the Baseline CSU stipulation to the Courthouse Wash Watershed (51,790 acres) and the Salt Wash Watershed (61,925 acres); and applying a CSU stipulation requiring closed loop drilling and other operational constraints to the Courthouse Wash and Salt Wash Watershed; would be the same as those described in Alternative B. However, Alternative C applies an NSO stipulation to these watersheds thus providing greater protection than Alternatives B and D. Alternative A does not address these watersheds.

Impacts to riparian resources from applying an NSO stipulation in Alternative D to the suitable WSR segments along the Colorado and Green Rivers with the exception of Colorado River Segment 3 in Monticello (19,347 acres) would be the same as those described under Alternatives A and B. Alternative C closes these WSR segments, thereby providing greater protection than Alternatives A, B, and D.

Impacts to riparian resources from applying BMPs for oil and gas leasing (Appendix B) would be the same as those described in Alternatives B and C. BMPs for riparian resources are not specified in Alternative A.

4.12 SOCIAL AND ECONOMIC

This section presents potential impacts to social and economic conditions (socioeconomics) from implementing management actions presented in Chapter 2. Existing socioeconomic conditions and trends are summarized in Chapter 3 and detailed in the *Socioeconomic Baseline Report* (BLM 2012c). In general, the impacts are identified as occurring anywhere within the socioeconomic study area (a two-County area consisting of Grand and San Juan Counties as defined in Chapter 3) based on the alternatives defined for management of the Planning Area, the more geographically limited area that will be affected by the Plan.

Note that in economic and social analysis, the term "impact" may construe either positive, negative, or mixed outcomes. The "direction" of the impact should be clear from the context, but may also vary depending on the perspective of the reader. For instance, generation of jobs and income is considered by most people to be a positive effect. Where jobs or income are lost (for instance, under one alternative compared to another), this is explicitly indicated in the text below. Social impacts may be judged differently by different stakeholders. For instance, stakeholders who tend to view natural resource development as essential to their communities may view large-scale mineral development as aligned with their personal and community interests, while others who tend to favor conservation may feel it is contrary to their or their community's interests. Some socioeconomic impacts are addressed quantitatively below. Many impacts, including both economic and social impacts, can only be addressed qualitatively given available information and resources.

4.12.1 Assumptions

The analyses in this section are based on the following general assumptions (additional assumptions specifics to particular resource uses are provided in subsections below):

- Economic impacts to the socioeconomic study area in terms of labor earnings and employment, would accrue from BLM influenced activities such as oil development, potash development, livestock grazing, and recreation.

- Employment and income (including both labor earnings and non-labor income) would continue to be a driver of economic and population growth in the socioeconomic study area.

- Housing supply and costs and community infrastructure and services may be constraints on population growth in some locations within the socioeconomic study area.

- Tax and royalty revenues derived from activities on BLM lands would continue to have fiscal implications for communities within the socioeconomic study area, State, and Federal Government.

- Activities and resources available in and around the Planning Area would continue to be important to the current and future residents' quality of life.

- The pace and timing of oil development activities is dependent on a variety of factors outside the management decisions of the BLM. These include national and international energy demand and prices, production factors within the Planning Area, and business strategies of operators. Actual economic impacts could vary if actual development or production varies from projections, or if prices change.

- The pace and timing of potash development activities is also dependent on a variety of factors outside the management decisions of the BLM. These include demand for potash and resultant market prices, availability of water, production factors within the Planning Area, and business

strategies of operators. The analysis below uses potash deployment scenarios from multiple sources. Actual impacts could vary if the rate of development over the study period is different.

- Demand for use of BLM-administered land for recreational activities throughout the Planning Area will remain steady or increase through the life of the plan (15 years).

- Demand for use of BLM-administered land for livestock grazing will continue through the life of the plan.

4.12.2 Methods of Analysis

Economic Impact Analysis

The analysis below of economic impacts that are reflected in market transactions uses two general approaches. These are quantitative analysis, and qualitative analysis. Economic analysis of nonmarket values uses a different approach (see below).

The quantitative analysis approach is used when possible given adequate available information and resources. In this study, adequate data was available for four resource uses: oil, potash, recreation, and livestock grazing. The basic strategy used is to first identify the primary impacts of an economic activity affected by management decisions. For instance, primary impacts include expenditures made by oil companies to drill a well and complete the well for production. Primary impacts also include the value of the oil that is produced and sold, which can provide fiscal benefits to the socioeconomic study area. Next, where primary impacts can be quantified, they can generally also be run through an economic model to estimate the economic activity that is generated as the primary impact ripples through the economy, "upstream" to providers of goods and services necessary for production, and "downstream" as income generated from production is spent by the households that receive the income.

The upstream, downstream, and total effects are estimated in this study through use of the IMPLAN (IMPact analysis for PLANning) model. The IMPLAN model was originally developed by the Forest Service and is commonly used by the BLM and many other government and private sector organizations to estimate the total economic impacts of various activities, actions, and policies. The model tracks inter-industry and consumer spending in a local (or regional) economy, allowing estimation of indirect and induced economic impacts in the local economy that result from the original economic activity or a change in economic activity. Indirect impacts result from local inter-industry purchases caused by the direct impact, and induced impacts results from re-spending of labor income (i.e., local purchases by households of employees and proprietors of the affected industries). The re-spending represented by indirect and induced impacts is often referred to as the "multiplier effect." Outputs of the IMPLAN model include employment, labor income, value added and gross regional economic output.

It is important to note that IMPLAN, based on some of its data sources, does not distinguish between full-time and part-time jobs. Sectors with higher labor earnings per job are likely to reflect a high proportion of full-time jobs, while sectors with low labor earnings per job often reflect a significant number of part-time jobs. For instance, jobs related to oil or potash development and production (particularly direct effect jobs) are likely be higher-paying than the predominantly service-related jobs associated with recreation or the agricultural jobs associated with grazing. (See the mining, service-related, and agricultural sector average annual wages in Table 4-5 and Table 4-6 of the Socioeconomic Baseline Report.) Similarly, jobs related to oil or potash development and production are more likely to be full-time jobs and also less affected by seasonal layoffs than jobs associated with recreation or grazing.

It is also important to note that IMPLAN relies on current (or very recent) trade flows assumptions present in the local economy. The further out the planning horizon is, the more likely structural changes in the local economy could occur, rendering future impact projections less reliable.

Fiscal Impact Analysis

Fiscal impacts include generation of royalties, property taxes, and sales taxes. Estimates of these government revenues are based on: a) estimates of the revenue base, b) prevailing royalty and tax rates, and c) local shares of revenues, if applicable. For instance, the market value of oil production is the revenue base for Federal mineral royalties, the royalty rate is 12.5 percent and approximately 25 percent of the total revenues accrue to local (County) governments. The methods and assumption for calculation of fiscal impacts are provided below for each resource use addressed in the fiscal impacts section.

Nonmarket Value Impact Analysis

The term nonmarket values refers to the benefits individuals attribute to experiences of the environment or uses of natural and cultural resources that do not involve market transactions and therefore lack prices. As these values are not priced, they are difficult to estimate. Nonetheless BLM guidance calls for efforts to be made to identify and assess impacts to nonmarket values in the planning process (BLM 2013c).

Base Year Dollars and Discounting

All dollar figures throughout the economic analysis are in constant 2014 dollars. This is the base year used in the IMPLAN model.

All dollar figures used in the tables below represent the total value across the period 2015 to 2029. Values for future years are *discounted* to adjust for the "time value of money." This is an economic concept that refers to the value of a given amount of money being less in the future. Most people, presented with a choice, would rather have a dollar now than a dollar 10 years from now, or even one year from now because the dollar can be put to productive use now. When monetary costs and benefits of an action vary over time (e.g., for a capital project the costs are up-front but the benefits occur over many years), economists adjust for the time value of money by applying an annual discount rate to the amounts in future years. This is different than adjusting for inflation, which is a loss in money's value in the future due to a rise over time in prices for given products and services across the economy. The result of adjusting for the time value of money is known as the "present value." Providing present values for 2015-2029 for all the economic impact analyses allows for comparison – based on a reasonably lengthy period, and subject to some differences in approach noted in each resource use summary section – of the relative economic impacts of each resource use for each of the field offices and planning units.

The choice of a discount rate is a key analytical decision, because as the discount rate increases, the value of future dollars when "brought back to the present" decreases. Often, economists use the discount rates recommended by the Federal Office of Management and Budget (OMB) in OMB Circular A-94, "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs" (revised December, 2013) (OMB 2013). OMB pegs discount rates to interest rates on Treasury notes and bonds of specific maturities corresponding to the planning period for a particular economic analysis. As of the December 2013 edition of Circular A-94 Appendix C, the recommended annual real discount rate (a rate from which any inflation premium has been removed) for a 10-year planning period is 1.0 percent, and 1.6 percent for a 20-year planning period. OMB suggests linear interpolation for other lengths of time. Given that the planning horizon for the current effort is 15 years, it seems appropriate to use a real discount rate of 1.3 percent.

Social Impact Analysis

Social impacts may be driven by economic impacts, such as when changes in employment due to management decisions lead to impacts on population, housing, and community services. Other impacts may be more purely social and cultural in nature and can include impacts on quality of life, recreation and amenity values, and traditional land uses and associated cultural values. Social impacts may be marginal or substantial, depending on the degree to which new and revised management actions alter the course set in previous BLM decisions.

Sometimes social impacts can be quantified; however, in this analysis, social impacts are described qualitatively. This is because social impacts of BLM management decisions may vary considerably depending on the nature of the communities involved.

A key aspect of the social impacts analysis approach is to address impacts based on the varying points of view of key types of stakeholders. The Socioeconomic Baseline Report identifies several broad categories of stakeholders to minerals decisions in the Planning Area. These categories reflect different linkages people have to public lands. They also reflect distinct sets of attitudes, beliefs, values, opinions, and perceptions about public resources and the effects of various management policies and actions. Categorization of stakeholders is not meant to imply that all individuals and social groups fit neatly into a single category; many specific individuals or organizations may have multiple interests and would see themselves reflected in more than one stakeholder category. The point of categorization is to allow differentiation of social impacts based on broad differences in points of view. The social impacts analysis below assesses the alternatives against the different points of view in the broad stakeholder categories.

Environmental Justice Impact Analysis

Definitions and methods for analysis of potential environmental justice (EJ) issues are described in the Socioeconomic Baseline Report. In short, the socioeconomic study area was screened in the Socioeconomic Baseline Report to identify communities with minority and low-income populations that qualify as potential EJ populations based on guidance for EJ analysis from the Council on Environmental Quality. These Counties and their potential EJ populations are noted in Chapter 3. Further assessment of the likelihood of impacts to these populations is presented below.

4.12.3 Economic Impacts

This section presents the economic impacts associated with resource uses affected by the plan. This includes impacts to employment, labor income, and total economic output as determined through analysis with the IMPLAN model. This section also qualitatively addresses some additional economic effects. Separate sections below address fiscal impacts and impacts to nonmarket values.

Readers should keep in mind that the figures from the IMPLAN model (and the fiscal analysis, as well) *only* represent the quantifiable economic impacts of each alternative. There are many economic and social costs that are not encompassed in the IMPLAN analysis and therefore are not reflected when the economic numbers below for one alternative are compared to those for another alternative. For instance, it is likely that Alternative A has higher social impacts and nonmarket value impacts due to much higher amounts of minerals development under Alternative A. Minerals development necessarily has environmental costs; very high rates of development can result in social costs, such as reductions in community cohesiveness, increases in crime, and other impacts to quality of life. However, these externalities (costs not directly reflected in a particular market transaction such as an investment in developing an oil well) are difficult to quantify and are not estimated in this study. Some are addressed qualitatively in the sections on nonmarket value impacts and social impacts below.

The resource uses for which the IMPLAN results are summarized in this subsection are:

- Oil development and production
- Potash development and production
- Recreation
- Livestock grazing.

Fiscal impacts on State and local governments are discussed separately in Section 4.12.4, below.

Oil Development and Production

This section presents the results of the economic impact analysis for oil development and production. The impacts for oil development are presented first, followed by impacts for oil production.

It is important for readers to note that the results presented here only address *new* oil wells on Federal mineral estate within the Planning Area. The economic figures presented below for the new oil wells are a subset of the economic impacts of all oil wells (new and existing) on Federal mineral estate in the Planning Area. Put another way, the figures below do *not* include the economic impacts of any wells (new and existing) on Federal mineral estate outside of the Planning Area nor of any wells (new and existing) on non-Federal mineral estate. Likewise, the differences for Alternatives B1, B2, C, and D in comparison to Alternative A, as shown below, only represent changes for new wells on Federal mineral estate in the Planning Area; they do *not* represent the percentage change to *total* economic activity resulting from all oil development and production. The percentage change to total oil- and gas-related economic activity would be smaller. This is because while the absolute difference in dollars or jobs would be as shown in the tables below, the base for comparison, all oil-and gas-related economic activity, would be larger because it would include the contributions of existing wells on Federal mineral estate within the Planning Area and of wells on non-Federal mineral estate.

Assumptions

The analysis below relies on the following assumptions:

- The typical well depth (which affects drilling and operating costs) is assumed to be 12,000 feet, counting vertical depth and horizontal extensions.

- Based on recent drilling success rates for horizontal wells drilled within the Planning Area, it is assumed that 60 percent of the wells will be productive and 40 percent will be dry holes, which would be abandoned and successfully reclaimed within a 10-year period. Regardless of success or not, the development costs for productive and dry holes would be similar. Oil production, operational costs, and their associated impacts would not occur on dry holes.

- Each well pad would accommodate four wells.

- Drilling activity would be evenly distributed throughout the 15-year planning horizon. Employment associated with drilling and completion activities would remain constant on an annual basis, assuming that labor requirements per year would not change.

- The average cost to drill and complete a well in the Planning Area is $7.5 million based on the analysis below, with local purchase percentages as described below. To the extent that the number of wells drilled, associated costs, or local purchase percentages differ, the economic impacts would differ.

- Most of the impacts of the actual market value of oil production accrue outside the socioeconomic study area. This is because the producers of these resources tend to reside outside the socioeconomic study area. Grand and San Juan Counties lack the infrastructure needed to refine and market this production. However, local benefits of oil production will accrue from the operational cost for producing wells.

- Not all operationally required goods and services will be purchased locally. Local purchase percentages were estimated by BLM minerals staff.

- The number of successful wells incurring operational costs will increase over the life of the plan as the number of new successful wells increases.

- Operational employment is assumed to be a multiple of the successful wells in operation. It is likely that the additional numbers of employees needed to operate wells will be fewer, due to the likelihood of economies of scale.

Economic Impacts of Oil Development

In order to estimate the impacts of oil development in the Planning Area, it is necessary to get a reasonable estimate of the total costs of oil well drilling and completion, assign these costs to relevant sectors in the IMPLAN model, and determine the local spending percentages attributable to these sectors. The costs to drill and complete an oil or gas well vary tremendously across geologies and landscapes. Factors affecting costs include well spacing, drilling depth, drilling technology (e.g., vertical versus horizontal), the underlying geology, and the availability of local goods and services. Table 4-22 describes some recent cost estimates which may be relevant to the Planning Area.

Table 4-22. Recent Bureau of Land Management Analyses of Oil Well Drilling and Completion Costs

Source Document	Area	Cost Estimate
Final Environmental Impact Statement – Gasco Uinta Basin Natural Gas Project (BLM 2012d)	Vernal Field Office	$3.5 to $4.0 million average
Draft Greater Sage-Grouse Land Use Plan Amendment/Draft Environmental Impact Statement for the Utah Sub Region, Appendix W Economic Impact Analysis Methodology (BLM 2013d)	Utah Statewide	$3.25 million average
The Wyoming Greater Sage-Grouse Draft Land Use Plan Amendment and Draft Environmental Impact Statement (BLM and USFS 2013)	Wyoming Statewide	$4.503 million average
Fidelity Exploration and Development Company: Presentation to Moab Chamber of Commerce, February, 2014 (Fidelity Exploration and Development Company 2014)	Moab Field Office	$10 to $11 million

The costs summarized in Table 4-22 cover a wide variety of drilling scenarios. To estimate the costs for a future well in the Planning Area, the present analysis, based on discussion with BLM minerals specialists, assumes a cost that lies between the recent estimates for Wyoming ($4.5 million per well), and Fidelity's estimates for the Big Flat area (the most recent activity within the Planning Area) of $10-11 million per well.[1] This estimate ($7.75 million based on Fidelity's higher estimate) constitutes the basis for the analysis that follows. To the degree the development costs are higher or lower, the economic impact would be

[1] *The statewide estimates are for all types of wells, whereas Fidelity's estimates are for more costly directional drilling.*

correspondingly more or less than the estimates that follow. To aid the reader, the analysis will also display the marginal impact per $1 million spent per well. The cost figures per well are common to all alternatives, with the number of wells projected and resultant impacts varying across alternatives.

The next step in the analysis is to allocate the $7.75 million cost per well across IMPLAN sectors and estimate the percentage of these costs that utilize local resources. Since the socioeconomic study area contains very little minerals infrastructure, most spending is expected to occur outside the socioeconomic study area, with correspondingly less local employment and labor income benefits. Table 4-23 displays this allocation; it is based on BLM estimates of local purchase percentages for the Wyoming Statewide sage grouse plan amendment process (Taylor 2014). Table 4-24 displays the economic impact in the socioeconomic study area of drilling one $7.5 million well, and the marginal impact per additional (or lower) $1 million. To the extent that the local purchase percentage of goods and services are higher (or lower) then those given, the economic impact would be correspondingly greater (or less). Table 4-25 shows the total impacts over the life of the Plan for the estimated well cost of $7.5 million, by alternative.

Table 4-23. Allocation of Well Drilling and Completion Costs to IMPLAN Sectors, with Local Purchase Percentages

Cost Element	Drilling		Completion		
	Percentage of Costs	Local Purchase Percentage	Percentage of Costs	Local Purchase Percentage	IMPLAN Sector
Site Preparation	7.3%	95.0%	5.0%	95.0%	36
Drilling Rig	28.6%	5.0%	1.4%	15.0%	28
Support Services	32.4%	20.0%	49.3%	20.0%	29
Consumables	2.1%	30.0%	0.0%	30.0%	319
Tangibles	1.2%	0.0%	15.0%	0.0%	319
Equipment Rental	19.3%	25.0%	9.6%	25.0%	365
Engineering Service	3.1%	0.0%	9.6%	0.0%	369
Facilities Construction	4.0%	30.0%	3.2%	30.0%	35
Transportation	1.7%	10.0%	6.9%	50.0%	335
Communication	0.2%	0.0%	0.1%	0.0%	351

Source for percentage of drilling costs by IMPLAN sector: BLM Wyoming (Taylor 2014)
Source for local purchase percentage: Moab BLM minerals staff

Table 4-24. Economic Impacts of Drilling and Completing One Well and Associated Marginal Economic Impacts on the Local Economy*

Impact Type	One Well @ $7.5M			Marginal Impact per $1M		
	Employment	Labor Income	Output	Employment	Labor Income	Output
Direct Effect	10.0	$488,929	$1,654,563	1.34	$65,191	$220,608

Impact Type	One Well @ $7.5M			Marginal Impact per $1M		
	Employment	Labor Income	Output	Employment	Labor Income	Output
Indirect Effect	2.3	$65,169	$292,373	0.31	$8,689	$38,983
Induced Effect	2.0	$58,224	$224,774	0.27	$7,763	$29,970
Total Effect	**14.3**	**$612,322**	**$2,171,710**	**1.92**	**$81,643**	**$289,561**

Source: IMPLAN v 3.1. All figures in 2014 dollars.
*Refer to IMPLAN discussion in the Methods of Analysis section above for definitions and assumptions.

Table 4-25. Economic Impacts of Oil Well Drilling and Completion by Alternative

Alternative	Total Wells	Annual	Life of Plan		
			Employment	Labor Income	Output
A	**232**	**15.4**			
Direct Effect			154.5	$102,013,678	$345,219,736
Indirect Effect			36.1	$13,597,276	$61,002,766
Induced Effect			30.8	$12,148,194	$46,898,366
Total Effect			**221.3**	**$127,759,148**	**$453,120,868**
B1	**152**	**10.1**			
Direct Effect			101.3	$66,905,075	$226,410,346
Indirect Effect			23.6	$8,917,694	$40,008,308
Induced Effect			20.2	$7,967,322	$30,758,019
Total Effect			**145.1**	**$83,790,091**	**$297,176,673**
B2	**188**	**12.5**			
Direct Effect			125.4	$82,803,310	$280,210,824
Indirect Effect			29.3	$11,036,750	$49,515,232
Induced Effect			25.0	$9,860,547	$38,066,855
Total Effect			**179.7**	**$103,700,607**	**$367,792,911**
C	**36**	**2.4**			
Direct Effect			24.1	$15,898,236	$53,800,478
Indirect Effect			5.6	$2,119,056	$9,506,925
Induced Effect			4.8	$1,893,225	$7,308,836
Total Effect			**34.5**	**$19,910,517**	**$70,616,239**
D	**168**	**11.2**			
Direct Effect			112.3	$74,191,766	$251,068,899
Indirect Effect			26.2	$9,888,928	$44,365,648
Induced Effect			22.4	$8,835,050	$34,107,902
Total Effect			**160.9**	**$92,915,744**	**$329,542,449**

Alternative	Total Wells	Annual	Life of Plan		
			Employment	Labor Income	Output

All dollar figures are in 2014 dollars, and represent the present value of a 15-year stream of impacts.
Employment represents average jobs per year. Actual employment likely will be less, since one crew typically can drill 4 wells per year.

Economic Impacts of Oil Production

Other than fiscal impacts (discussed below), the economic impacts in the socioeconomic study area from production are limited to those generated by the spending necessary to keep productive wells in operation. As with drilling and completion costs, operating costs can vary greatly. The current analysis relies on data from the U.S. Energy Information Administration (2010), which has compiled data on operating costs by well depth and by region of the country. Based on the assumed 12,000 well depth and the Energy Information Administration data, the average annual operating cost for this depth well (in 2013 dollars) is estimated at $60,460. Table 4-26 shows the breakdown of these costs, and the percentages of each that are anticipated to occur within the socioeconomic study area. Local purchase percentages were provided by BLM minerals staff. The Energy Information Administration data ends in 2009, but dollar values have been updated to 2013 dollars.

Table 4-27 shows the total impacts over the life of the plan, by alternative.

Table 4-26. Annual per Well Local Purchase Percentages and Purchases of Goods and Services

Cost Component	% of Total Operating Costs	Local Purchase %	Local Spending (per well)
Normal Daily Expense			
Supervision and Overhead	8.34%	90.00%	$4,537
Labor (pumper)	12.80%	100.00%	$7,741
Auto Usage	1.67%	100.00%	$1,013
Chemicals	3.06%	50.00%	$925
Fuel, Power & Water	18.53%	100.00%	$11,204
Operative Supplies	0.97%	90.00%	$529
Surface Maintenance			
Repair & Services:			
Labor (roustabout)	3.96%	60.00%	$1,437
Supplies & Services	5.83%	75.00%	$2,646
Equipment Usage	1.40%	50.00%	$425
Subsurface Maintenance			
Repair & Services:			
Workover Rig Services	4.83%	30.00%	$875
Remedial Services	10.12%	30.00%	$1,836
Equipment Repair	27.79%	40.00%	$6,720

Cost Component	% of Total Operating Costs	Local Purchase %	Local Spending (per well)
Total			**$39,888**

Sources: U.S. Energy Information Administration (2010) for costs; dollar values updated to 2013 dollars. BLM Moab minerals staff for local purchase percentages.

Table 4-27. Economic Impacts of Oil Well Operating Costs by Alternative, over Life of Plan

Alternative	Life of Plan		
	Employment	Labor Income	Output
A			
Direct Effect	7.91	$4,703,323	$38,744,889
Indirect Effect	3.83	$1,732,863	$7,453,555
Induced Effect	1.76	$674,324	$2,603,284
Total Effect	**13.50**	**$7,110,510**	**$48,801,728**
B1			
Direct Effect	5.19	$3,084,647	$25,410,609
Indirect Effect	2.51	$1,136,488	$4,888,371
Induced Effect	1.16	$442,251	$1,707,349
Total Effect	**8.86**	**$4,663,386**	**$32,006,329**
B2			
Direct Effect	6.42	$3,817,632	$31,448,774
Indirect Effect	3.11	$1,406,544	$6,049,964
Induced Effect	1.43	$547,341	$2,113,055
Total Effect	**10.96**	**$5,771,517**	**$39,611,793**
C			
Direct Effect	0.60	$270,057	$1,161,593
Indirect Effect	0.27	$105,089	$405,707
Induced Effect	2.10	$1,108,131	$7,605,464
Total Effect	**2.97**	**$1,483,277**	**$9,172,764**
D			
Direct Effect	5.75	$3,420,599	$28,178,101
Indirect Effect	2.78	$1,260,264	$5,420,767
Induced Effect	1.28	$490,417	$1,893,297
Total Effect	**9.81**	**$5,171,280**	**$35,492,165**

All dollar figures are in 2014 dollars, and represent the present value of a 15-year stream of impacts.
Employment represents average jobs per year. Actual employment may be less, due to likely economies of scale in operations.

Summary of Economic Impacts by Alternative

Impacts from Alternative A (No Action)
Under Alternative A, oil development on Federal mineral estate in the Planning Area would generate $453.1 million (in present value and 2014 dollars) in total economic output over the 15-year life of the plan. This economic activity would include $128.7 million in labor earnings, and support an average of 221 jobs per year. Operating successful wells over the life of the plan would generate an additional $48.8 million in total economic output over the 15-year life of the plan, and would generate $7.1 million in labor earnings, and support an average of 13.5 jobs per year.

Impacts from Alternative B1
Under Alternative B1, oil development on Federal mineral estate in the Planning Area would generate $297.1 million (in present value and 2014 dollars) in total economic output over the 15-year life of the plan. This economic activity would include $83.8 million in labor earnings, and support an average of 145 jobs per year. Operating successful wells over the life of the plan would generate an additional $33.9 million in total economic output over the 15-year life of the plan, $4.7 million in labor earnings, and support an average of 8.8 jobs per year.

Impacts from Alternative B2
Under Alternative B2, oil development on Federal mineral estate in the Planning Area would generate $367.8 million (in present value and 2014 dollars) in total economic output over the 15-year life of the plan. This economic activity would include $103.7 million in labor earnings, and support an average of 180 jobs per year. Operating successful wells over the life of the plan would generate an additional $42 million in total economic output over the 15-year life of the plan, and would generate $5.8 million in labor earnings, and support an average of 11 jobs per year.

Impacts from Alternative C
Under Alternative C, oil development on Federal mineral estate in the Planning Area would generate $70.6 million (in present value and 2014 dollars) in total economic output over the 15-year life of the plan. This economic activity would include $19.9 million in labor earnings, and support an average of 34 jobs per year. Operating successful wells over the life of the plan would generate an additional $9.1 million in total economic output over the 15-year life of the plan, $1.5 million in labor earnings, and support an average of 3 jobs per year.

Impacts from Alternative D
Under Alternative D, oil development on Federal mineral estate in the Planning Area would generate $329.5 million (in present value and 2014 dollars) in total economic output over the 15-year life of the plan. This economic activity would include $92.9 million in labor earnings, and support an average of 161 jobs per year. Operating successful wells over the life of the plan would generate an additional $35.5 million in total economic output over the 15-year life of the plan, $5.2 million in labor earnings, and support an average of 9.8 jobs per year.

Potash Development and Production

This section presents the results of the economic impact analysis for potash leasing and development. The discussion is separated into three areas:

- Construction of potash production facilities (excluding wells)
- Operation of potash production facilities
- Drilling and operation of wells

Assumptions

The analysis below relies on the following assumptions:

- Potash leasing would be considered under Alternatives A, B1, and D. No potash leases or permits would be issued under Alternatives B2 or C.

- Potash leasing, exploration, and development would occur in the Planning Area during the planning period. However, this assumption is predicated on additional economic assumptions:

  – Potash market prices rebound sufficiently to make extraction and processing economically viable. As of September, 2014, the price was $287 per ton. This price is probably not sufficient to allow for economically viable potash development in the Planning Area. For example, estimates of new production in Saskatchewan, with shallower depth wells than would be necessary in the Planning Area, require a market price of over $400 per ton to be economically viable. Further, expansion of existing facilities require a much lower cost, approximately $200 per ton, to be economically viable, resulting in a potential competitive disadvantage for new facilities in the Planning Area (GenSource Potash Corp 2013, Mineweb 2013).
  – Related to the above, sufficient investment capital would need to be acquired. First year costs under Alternative A, for example, could total over $2.99 billion (see below). This figure represents over 3.5 times the size of total economic output in Grand and San Juan Counties combined in 2012, based on IMPLAN data for the two counties. The uncertainty over future potash prices may make the raising of this much investment capital problematic. Further, the aforementioned figures exclude infrastructure costs such as pipelines, roads, power lines and, importantly, rail access. These costs could increase overall development costs significantly and further complicate the raising of investment capital.
  – Potash wells and associated fiscal impacts depend on construction and operation of potash production facilities (PPF). As just noted, construction and operation of such facilities may not be economically viable under current market conditions for potash. Without the associated PPF, the drilling and completion of potash development wells is unlikely to occur.

- PPFs would be of the capacity assumed in the assumptions for Section 4.8.2 (Potash).

- Non-production potash wells would cost an average of $3.25 million to drill, as described below, but would incur no subsequent completion or operating costs.

- Potash production wells would cost an average of $7.75 million to drill and complete (i.e., similar to an oil well in the Planning Area), and would incur operating costs similar to those described in the section above for successful oil wells.

- There would be an average of 4 production wells per pad, which would be drilled in equal numbers over the life of the plan.

- Additional infrastructure costs (roads, transmission lines, pipelines, railroad spurs, etc.) are not considered in the present analysis, but would be considered in site-specific analysis pursuant to facility construction.

Economic Impacts of Potash Production Facility Construction

A reasonably accurate estimate of the economic impacts of constructing a PPF on the scale envisioned in the alternatives requires reliable estimates of several parameters. These estimates include the costs incurred in construction, and the percentage of locally-sourced goods and services (especially labor). There is a

paucity of data on these costs, as there is only limited potash production in the United States, in only three States (Utah, New Mexico, and Michigan). Many of the existing facilities are old. Their construction costs may not be relevant, and are often unavailable. There are some recently constructed and/or approved facilities in New Mexico and Saskatchewan, and it is sometimes possible to get estimates of new facility construction cost. Most of this data, however, is proprietary and usually not of sufficient detail to assist an independent analysis. Table 4-28 summarizes some potash projects in Utah and North America. As can be gleaned from the table, the costs, when available, vary greatly across projects and geographies.

Table 4-28. Utah-based and Recent North American Potash Processing Facility Projects and Economic Impacts

Company	Location	Type	Capacity (1,000 tons)	Cost ($ million)		Employment		Status
				Construc-tion	Opera-tion	Construc-tion	Opera-tion	
Intrepid[1]	Moab, UT	solar solution	110	NA	NA	NA	50	Active
Intrepid[2]	Carlsbad, NM	solar solution	250	190-200	11.4-13.9	272	36	Active
Intrepid[1]	Wendover, UT	solar solution	100	NA	NA	NA	51	Active
IC Potash[3]	Carlsbad, NM	mine/solar /crystalli-zation	990	813	NA	1,440	502	ROD signed, awaiting feasi-bility study
Potash Corp[4] (Patience Lake)	Saskatche-wan	solar solution	370	NA	NA	NA	92	Active
K20[5]	UT	Crystal-lization	2,000	2,400	40.3	2,570	190	Propo-sal
K & S[6]	Saskatche-wan	Crystal-lization	2,000	4,100 CDN*	NA	NA	NA	2017

NA: Not Available
*CDN=Canadian
[1] Intrepid Potash, Inc. 2013
[2] BLM 2012e
[3] BLM 2014b
[4] PotashCorp 2014
[5] Planvest, Inc. 2010
[6] K & S Corporation 2013

As can be seen from the table, construction costs, where available, range from $190-200 million (Intrepid, Carlsbad) for a 250 ton solar evaporation facility, to $4.1 billion CDN ($3.61 billion US) for a 2 million ton crystallization facility. K2O Corporation has proposed a similar size crystallization facility for the southern part of the Planning Area, and estimated its cost at $2.4 billion. Estimates of employment during construction also vary widely. Intrepid (Carlsbad), for example, estimates its 250 thousand ton facility required 272 workers to construct. The proposed IC potash mine, also in Carlsbad, estimates that a facility four times that size would require a workforce more than 5 times the size of Intrepid's project.

Given the potential range of assumed PPF capacity under each alternative, the wide variation in estimated costs for other PPF projects, and the lack of reliable data inputs for IMPLAN, the analysis of economic impacts for PPF construction is based on simple extrapolation of figures from Table 4-28, relative to the assumed capacities, in order to provide impact estimates. These estimates are shown in Table 4-29. When reviewing the estimates in Table 4-29, it should be remembered that the overall economic impact depends not only on total costs, but on where those monies are spent. Given the goods and services available in the socioeconomic study area, it is likely that much of the spending and employment associated with these projects will rely on sources outside the socioeconomic study area, with correspondingly reduced economic benefits to local businesses and residents. Any PPF proposal within the Planning Area would require a site-specific EIS prior to approval, at which time a much more detailed economic analysis would be provided.

Table 4-29. Estimated Economic Impacts of Potash Processing Facility Construction by Alternative

PPF type and capacity	Alternative		
	A	B1	D
400K ton solar [(1)]			
Expenditures	$320M		
Employment	435		
300K ton solar [(1)]			
Expenditures		$266M	$266M
Employment		362	362
2M ton crystallization [(2)]			
Expenditures	$2,400M		
Employment	2,570		
1M ton crystallization [(2)]			
Expenditures		$1,200M	
Employment		1,385	
1.02M ton crystallization [(2,3)]			
Expenditures			$1,200M
Employment			1,385
Total Estimated Impact			
Expenditures	$2,720M	$1,466M	$1,466M
Employment	3,005	1,747	1,747

[(1)] Extrapolated from Intrepid (Carlsbad) from Table 4-28, above.
[(2)] Extrapolated from K2O from Table 4-28, above.
[(3)] No differences in impacts between a 1M ton and 1.02M ton facility can be estimated given the available data. The differences would be small.

Economic Impacts of Potash Production Facility Operations

Economic impacts would also occur from potash production operations. The two primary components of potash operations are the annual operating costs to operate PPFs, and the costs associated with the drilling and operation of potash wells. Operating costs are discussed here; well drilling and operational costs are discussed separately, below.

As is the case with construction costs and associated employment to construct PPF facilities, estimates of annual operating costs (exclusive of wells) are difficult. Similar to the discussion in Table 4-29, Table 4-30 extrapolates estimates of annual operating costs and employment from Table 4-28. Annual operating costs, according to company-provided estimates, include fiscal benefits such as royalties and property taxes. These are discussed separately below, but the reader needs to be aware that these are also included in Table 4-30. A larger portion of operating expenditures than construction expenditures would likely be made within the socioeconomic study area, but some leakage of operating expenditures out of the socioeconomic study area is likely, with correspondingly reduced economic benefits to local businesses and residents.

Table 4-30. Estimated Economic Impacts of Potash Processing Facility Annual Operating Expenditures

PPF type and capacity	Alternative		
	A	B1	D
400K ton solar [(1)]			
Expenditures	$22M		
Employment	57		
300K ton solar [(1)]			
Expenditures		$18.5M	$18.5M
Employment		48	48
2M ton crystallization [(2)]			
Expenditures	$40.3M		
Employment	190		
1M ton crystallization [(2)]			
Expenditures		$20.15M	
Employment		95	
1.02M ton crystallization [(2,3)]			
Expenditures			$20.15M
Employment			95
Total Estimated Impact			
Expenditures	$62.3M	$38.65M	$38.65M
Employment	247	143	143

[(1)] Extrapolated from Intrepid (Carlsbad) from Table 4-28 above.
[(2)] Extrapolated from K2O from Table 4-28, above.
[(3)] No differences in impacts between a 1M ton and 1.02M ton facility can be estimated given the available data. The differences would be small.

Economic Impacts of Potash Well Drilling and Operations

Potash operations within the Planning Area will rely on wells similar to those used for oil and gas extraction. Economic impacts from potash well drilling and operations are based on the assumptions outlined at the beginning of this section, and the assumptions used for oil and gas wells. Local purchase percentages and the economic impacts associated with drilling and completing one potash development well are assumed to be the same as for an oil well. These impacts were outlined in Table 4-23 and Table 4-24, respectively. Drilling and completing production potash wells would cost an average of $7.75 million. Non-production

potash wells would cost an average of $3.25 million based on a recent EIS in Utah (BLM 2013d) and confirmed by BLM minerals staff.

Table 4-31 presents total impacts, by alternative, for drilling of non-production potash wells. Table 4-32 and Table 4-33 present total impacts, by alternative, for drilling and operating potash production wells.

Table 4-31. Economic Impacts of Developing non-Production Potash Wells over Life of Plan

Alternative	Total Wells	Annual	Life of Plan		
			Employment	Labor Income	Output
A	**133**	**8.9**			
Direct Effect			88.9	$58,735,148	$198,762,878
Indirect Effect			20.8	$7,828,735	$35,122,805
Induced Effect			17.7	$6,994,415	$27,002,089
Total Effect			**127.4**	**$73,558,298**	**$260,887,772**
B1	**72**	**4.8**	72.0		
Direct Effect			48.1	$31,796,471	$107,600,957
Indirect Effect			11.2	$4,238,112	$19,013,849
Induced Effect			9.6	$3,786,450	$14,617,672
Total Effect			**68.9**	**$39,821,033**	**$141,232,478**
D	**72**	**4.8**	72.0		
Direct Effect			48.1	$31,796,471	$107,600,957
Indirect Effect			11.2	$4,238,112	$19,013,849
Induced Effect			9.6	$3,786,450	$14,617,672
Total Effect			**68.9**	**$39,821,033**	**$141,232,478**

Non-production wells include exploration, water, disposal and monitoring.
Figures denominated in 2014 dollars, and represent the present value of 15 years sum of dollar-denominated annual impacts.
Employment represents average jobs per year. Actual employment likely will be less, since one crew typically can drill 4 wells per year.

Table 4-32. Economic Impacts of Developing Production Potash Wells over Life of Plan

Alternative	Total Wells	Annual	Life of Plan		
			Employment	Labor Income	Output
A	**416**	**27.7**			
Direct Effect			230.0	$183,712,945	$621,694,416
Indirect Effect			53.7	$24,486,869	$109,857,796
Induced Effect			45.8	$21,877,267	$84,457,663
Total Effect			**329.5**	**$230,077,081**	**$816,009,875**
B1	**216**	**14.4**			
Direct Effect			112.3	$95,389,414	$322,802,870

Alternative	Total Wells	Annual	Life of Plan		
			Employment	Labor Income	Output
Indirect Effect			26.2	$12,714,336	$57,041,548
Induced Effect			22.4	$11,359,350	$43,853,017
Total Effect			**160.9**	**$119,463,100**	**$423,697,435**
D	**228**	**15.2**			
Direct Effect			120.4	$100,688,826	$340,736,363
Indirect Effect			28.1	$13,420,688	$60,210,523
Induced Effect			24.0	$11,990,425	$46,289,296
Total Effect			**172.5**	**$126,099,939**	**$447,236,182**

Figures denominated in 2014 dollars, and represent the present value of 15 years sum of dollar-denominated annual impacts. Employment represents average jobs per year. Actual employment likely will be less, since one crew typically can drill 4 wells per year.

Table 4-33. Economic Impacts of Operating Production Potash Wells over Life of Plan

Alternative	Life of Plan		
	Employment	Labor Income	Output
A			
Direct Effect	19.6	$14,116,756	$116,290,577
Indirect Effect	9.5	$5,201,088	$22,371,421
Induced Effect	4.4	$2,023,945	$7,813,608
Total Effect	**33.5**	**$21,341,789**	**$146,475,606**
B1			
Direct Effect	9.6	$7,329,854	$60,381,646
Indirect Effect	4.6	$2,700,565	$11,615,930
Induced Effect	2.1	$1,050,895	$4,057,066
Total Effect	**16.3**	**$11,081,314**	**$76,054,642**
D			
Direct Effect	10.3	$7,737,068	$63,736,182
Indirect Effect	5.0	$2,850,597	$12,261,260
Induced Effect	2.3	$1,109,278	$4,282,458
Total Effect	**17.6**	**$11,696,943**	**$80,279,900**

Figures denominated in 2014 dollars, and represent the present value of 15 years sum of dollar-denominated annual impacts. Employment represents average jobs per year. Actual employment likely will be less, since one crew typically can drill 4 wells per year.

Summary of Economic Impacts by Alternative

The estimates described below do not include the economic impact to the socioeconomic study area of PPF construction and operating expenditures, due to the great uncertainty involved in estimating those impacts.

Should such facilities be constructed, the economic impact would likely be significant, and would be assessed in an EIS-level site specific analysis. See Table 4-29 and Table 4-30 for estimates of costs and associated employment.

It should also be noted that potash production has an export market and thereby has a positive effect on the national trade deficit. To the extent that market conditions and corporate investment decisions do in fact bring about new potash development and production, the benefits to the trade deficit would vary based on the amount of production that occurs from the level of development enabled by each alternative. Alternatives B2 and C would forego benefits to the national trade deficit because potash development on Federal mineral estate in the Planning Area would not occur.

Impacts from Alternative A (No Action)

Under Alternative A, potash development on Federal mineral estate from drilling non-production and production wells in the Planning Area could generate over $1.076 billion (in present value and 2014 dollars) in total economic output over the 15-year life of the plan. This economic activity could include more than $303 million in labor earnings, and support an average of 457 jobs per year. The costs of operating these wells over the life of the plan could generate an additional $146 million in total economic output over the 15-year life of the plan, $21 million in labor earnings, and support an average of 34 jobs per year.

Impacts from Alternative B1

Under Alternative B1, potash development on Federal mineral estate from drilling non-production and production wells in the Planning Area could generate over $564 million (in present value and 2014 dollars) in total economic output over the 15-year life of the plan. This economic activity could include more than $159 million in labor earnings, and support an average of 230 jobs per year. The costs of operating these wells over the life of the plan could generate an additional $76 million in total economic output over the 15-year life of the plan, $11 million in labor earnings, and support an average of 16 jobs per year.

Impacts from Alternative B2

Under Alternative B2, potash development on Federal mineral estate in the Planning Area would not occur, and there would be no economic impacts.

Impacts from Alternative C

Under Alternative C, potash development on Federal mineral estate in the Planning Area would not occur, and there would be no economic impacts.

Impacts from Alternative D

Under Alternative D, potash development on Federal mineral estate from drilling non-production and production wells in the Planning Area could generate over $588 million (in present value and 2014 dollars) in total economic output over the 15-year life of the plan. This economic activity could include more than $165 million in labor earnings, and support an average of 241 jobs per year. The costs of operating these wells over the life of the plan could generate an additional $80 million in total economic output over the 15-year life of the plan, $12 million in labor earnings, and support an average of 18 jobs per year.

Recreation

This section presents the results of the economic impact analysis for recreation. Section 4.12.4 discusses potential fiscal impacts relating to recreation visitation. Section 4.12.5 discusses potential non-market impacts associated with recreation.

Assumptions

The analysis below relies on the following assumptions:

- The historical growth of recreation visitation to BLM lands within the Planning Area will continue at 3.1 percent annually. The actual rate of change could be higher or lower, as historical trends are not a guarantee of future events.

- The mix of visitors (local versus nonlocal, overnight lodging versus overnight camping), as well as their relative spending patterns, will remain unchanged. Table 4-34 describes these baselines.

- The BLM does not expect a change in recreation visitation across alternatives. This assumption is predicated on potash production facilities not being located in areas of high recreation usage and visual values.

Table 4-34. Baseline Assumptions for Recreation Impact Analysis

Total (MLP Visitor Days: 2014 Total 630,524)	Local Day Use	Overnight Lodging	Overnight Camping
Percentage of Total	28.7 %	40.6 %	30.7 %
Spending by IMPLAN sector (dollars per visitor day)			
324-Retail Food & Beverage	5.42	21.50	13.45
326-Retail Gasoline	1.44	40.20	18.75
336-General Transit & Transportation	4.58	3.63	3.63
338-Sightseeing Transportation		3.63	3.63
409-Amusement Parks and Arcades	3.16	10.82	1.96
410-Other Amusement & Recreation		4.86	0.88
411-Hotels & Motels		32.37	
412-Other Accommodations		32.37	
413-Restaurants and Drinking Places		46.73	5.86
439-Federal Government & Payroll			9.34

Visitation data based on BLM (2014c) and BLM recreation staff estimates; Use percentages based on National Visitor Use Monitoring study for the Moab Field Office (National Visitation Use Monitoring [NVUM] 2007).
All dollar amounts based on NVUM (2007) and adjusted to 2014 dollars.

Based on these assumptions, the estimates of recreation use presented in Chapter 3 and the baseline data of Table 4-34, the economic impact analysis for recreation consists of one set of figures for all alternatives for the Planning Area. The estimated impacts over the 15-year life of the plan, based on a 3.1 percent annual growth rate in visitation, are shown in Table 4-35. There have been concerns expressed, however, that the choice of alternatives *could* affect recreation, especially under Alternative A. For example, Alternative A has greater potential to negatively impact scenic viewsheds valued by recreationists (see Section 4.19, Visual Resources and Soundscapes, and Section 4.10.3, Recreation for additional discussion). For this reason, Table 4-35 also shows the economic impact per 10,000 visitor day change in recreation, above (or below) the estimates shown for the assumed 3.1 percent growth rate. IMPLAN outputs are strictly linear, so any change resulting from smaller or larger estimates can be easily extrapolated.

Table 4-35. Economic Impacts of Recreation Visitation, over Life of Plan

Assumption	Life of Plan		
	Employment	Labor Income	Output
3.1% annual growth			
Direct Effect	889.3	$367,993,786	$582,319,612
Indirect Effect	88.1	$32,714,783	$73,001,513
Induced Effect	109.0	$45,884,186	$105,605,427
Total Effect	**1086.4**	**$446,592,755**	**$760,926,552**
10,000 visitor-days over/under estimate			
Direct Effect	14.05	$4,761,914	$10,350,517
Indirect Effect	1.39	$423,336	$1,765,165
Induced Effect	1.72	$593,751	$2,218,358
Total Effect	**17.16**	**$5,779,001**	**$14,334,040**

Figures denominated in 2014 dollars, and represent the present value of 15 years sum of dollar-denominated annual impacts.
Employment represents average jobs per year.
10,000 visitor day change is assumed constant over the planning period, and is not compounded at 3.1 percent.

Summary of Economic Impacts

Alternative A has the highest probability of displacing or reducing recreation visitation and associated spending due to the potential for greater concentrations of mineral development and the use of large scale potash processing facilities in high use recreation areas. Table 4-35 shows the economic impacts of marginal changes in visitation. There are examples of where large scale minerals activities have negatively affected the recreation economy. In Uintah County, for example, Dinosaur National Monument (a major recreation amenity) has seen a decline in visitation of over 40 percent from 1999-2014 (1999 being the year in which Uintah County reversed years of declining oil and gas production); oil production increased over 358 percent during the same time period. During that time period, natural gas production increased over 339 percent.

Under all action alternatives (B, C, and D) it is assumed that recreation visitor days to BLM lands within the Planning Area will continue to increase at the historical annual compound growth rate of approximately 3.1 percent. However, the recreation *experience* would differ by alternative as discussed in Section 4.10.3 which could impact total recreation spending. Based on a 3.1 percent growth assumption, recreation visitation in the Planning Area would generate $760.9 million (in present value and 2014 dollars) in total economic output over the 15-year life of the plan. This economic activity would include $446.6 million in labor earnings, and support an average of 1,086 jobs per year. To the extent that actual future visitation is greater or less, the corresponding economic impacts would be greater or less.

Livestock Grazing

This section presents the results of the economic impact analysis for livestock grazing. There is only one "phase" of economic activity for livestock grazing – livestock production. There is no "development" phase equivalent to the construction activities in the oil/gas and wind energy industries. The analysis was based around cattle grazing, which constitutes virtually all the livestock use potentially affected by the Plan alternatives.

This analysis addresses only the changes to the value of grazing that could result from the management alternatives. It does not estimate the value of all grazing occurring within the Planning Area.

Assumptions

- Livestock grazing would occur throughout the majority of the Planning Area.
- The following analysis is based on *permitted* use. Primarily due to drought conditions, *actual* use in most of the Planning Area has been less than permitted use for several years. In the short-term, actual forage use in the decision area may increase from current levels due to improving range condition and range recovery from recent drought. To the extent that actual use differs from permitted use, the economic impacts described below will increase or decrease.
- Affected permittees reside locally. To the extent that permittees reside outside the socioeconomic study area, the economic impacts on the socioeconomic study area would be less.
- The type of grazing use would remain about the same.
- Potash processing facilities involve the large scale construction of permanent facilities and the loss of vegetation and associated forage for livestock grazing. The drilling of oil and gas and potash wells would involve temporary and minimal loss of vegetation and an inconsequential loss of forage. Therefore, the economic impacts below are based on the loss of forage due to the development of potash processing facilities.

Economic Losses to Livestock Production

The livestock production economic analysis involved three major steps:

- Estimating the economic value of forage use.
- Estimating the amounts of forage on BLM-administered lands in the Planning Area that would be lost under each management alternative.
- Estimating the economic impacts based on the value of production; specifically, the value foregone due to the loss of BLM forage under each alternative.

Each of these steps is described in detail below.

Estimation of the Economic Value of Forage Use

The economic impact estimates for livestock grazing were based on permitted animal unit months (AUM) of forage use for cattle. One AUM is equal to the amount of forage consumed by a cow and calf during a 1-month grazing period. The direct value of production per AUM was estimated based on regional livestock production value data and ratios in the livestock economics literature. According to Workman (1986), it takes 16 AUMs to produce a marketable cow. Thus, the average value of an AUM can be estimated using data on the value of cattle production per bred cow and dividing by 16.

The value per AUM for cattle was based on a 10-year average (2004–2013) of the annual value of production per bred cow estimates from the United States Department of Agriculture (USDA) Economic Research Service's Commodity Cow-Calf Costs and Returns estimates for the Basin and Range portion of the United States. Both field offices within the Planning Area are located in the Basin and Range region. The methodology and data for calculation of the average value of cattle production from one AUM of forage is shown in Table 4-36.

Table 4-36. Value of an Animal Unit Month for Cattle Production, Basin and Range Region

Year	Value of Production Per Bred Cow [1]	AUMs Per Cow [2]	Value of Production Per AUM	IMPLAN Inflator	Inflated Value of Production Per AUM*	Cow-Calf Adjust-ment [3]	Adjusted Value of Production per AUM
2004	$706	16	$44.14	0.79	$56.02	1.2	$67.22
2005	$752	16	$47.03	0.78	$59.99	1.2	$71.98
2006	$720	16	$45.01	0.75	$60.17	1.2	$72.21
2007	$682	16	$42.59	0.76	$55.89	1.2	$67.07
2008	$496	16	$31.00	0.83	$37.35	1.2	$44.82
2009	$472	16	$29.50	0.74	$40.14	1.2	$48.16
2010	$571	16	$35.66	0.78	$45.78	1.2	$54.93
2011	$649	16	$40.54	0.99	$40.83	1.2	$48.99
2012	$745	16	$46.56	1.00	$46.56	1.2	$55.87
2013	$781	16	$48.78	1.01	$48.44	1.2	$58.13
10-year Average							**$58.94**

[1] U.S. Department of Agriculture, Economic Research Service (2013a).
[2] Workman (1986).
[3] U.S. Department of Agriculture, National Agricultural Statistical Service (2013b).
*Value times inflator.

Estimation of Lost Forage Utilization

The forage lost under each alternative was based on the acreage developed for potash production facilities. This acreage was multiplied by the Planning Area average permitted AUMs of forage per acre.

Economic Impacts of Reduced AUM Availability

The figures for the value per AUM for cattle grazing were multiplied by the number of AUMs potentially foregone under each alternative. The result was the total economic value of livestock production potentially foregone under each alternative, which was used as the direct impact input to the IMPLAN model. Table 4-37 shows the first year impact, as well as the present value of the sum of pacts over the Plan's 15-year planning horizon, assuming grazing use remains constant at the 15-year average number of permitted AUMs (or otherwise, that variations in use average out accordingly).

Table 4-37. Average Annual and Total Impacts on Livestock Grazing from Potash Processing Facility Areas Alternatives

	Economic Impact of Potential Loss of AUMs within Potash Processing Facility Areas					
	Alternative A		Alternative B1		Alternative D	
AUMs Potentially Lost	224		59		59	
Economic Impacts	**Annual**	**Life of plan**	**Annual**	**Life of plan**	**Annual**	**Life of plan**

	Economic Impact of Potential Loss of AUMs within Potash Processing Facility Areas					
	Alternative A		Alternative B1		Alternative D	
Direct Effects						
Output	$20,768	$281,378	$1,424	$19,294	$1,424	$19,294
Employment	0.17	0.17	0.01	0.01	0.01	0.01
Labor Income	$1,562	$21,169	$107	$1,452	$107	$1,452
Indirect Effects						
Output	$22,328	$302,507	$1,531	$20,743	$1,531	$20,743
Employment	0.16	0.16	0.01	0.01	0.01	0.01
Labor Income	$2,217	$30,037	$152	$2,059	$152	$2,059
Induced Effects						
Output	$1,619	$21,936	$111	$1,504	$111	$1,504
Employment	0.01	0.01	0.00	0.00	0.00	0.00
Labor Income	$433	$5,872	$30	$403	$30	$403
Total Effect						
Output	$44,715	$605,821	$3,066	$41,542	$3,066	$41,542
Employment	0.35	0.35	0.02	0.02	0.02	0.02
Labor Income	$4,213	$57,073	$289	$3,914	$289	$3,914

Annual is the average annual impact over 15 years in 2014 dollars.
Life of plan is the present value of 15 years sum of dollar-denominated annual impacts.
Employment represents average jobs per year.

Summary of Economic Impacts by Alternative

Impacts only occur under the alternatives that allow for development of potash production facilities. The impacts also presume development of such facilities actually occurs.

Impacts from Alternative A (No Action)

Under Alternative A, construction of potash processing facilities could occur anywhere within 210,884 acres that are open with standard terms and conditions and 443,056 acres open with CSU and TL stipulations. Construction of solar evaporation potash processing facilities in these areas could permanently occupy up to 3,716 acres and remove up to 224 AUMs. In addition, construction of a crystallization potash processing facility could occupy up to 500 acres and remove up to 26 AUMs. The annual average direct economic impact would be a loss of $44,715 in output, 0.35 jobs, and $4,213 in labor income per year, on average.

Impacts from Alternative B1

Applying a CSU stipulation to all potash leases that requires potash processing facilities to be located within a PPFA (44,660 acres), would localize the disturbance and infrastructure to the PPFAs and prevent large-scale disturbance from potash processing in other areas in the Planning Area that could occur under

Alternative A. Limiting the area available for potash processing facilities would reduce loss of forage outside of those areas from potash processing and help retain AUMs available for livestock. The estimated amount of acreage that could be disturbed by potash processing facilities is 3,037 acres, which could result in the loss of 59 AUMs that would no longer be available to livestock under this alternative. The loss of AUMs within the PPFAs would be much less than that projected for Alternative A. The annual average direct economic impact would be a loss of $3,066 in output, 0.02 jobs and $289 in labor income.

Impacts from Alternative B2

Under Alternative B2, there would be no land available for potash development. Therefore, no AUMs would be removed due to potash development.

Impacts from Alternative C

Under Alternative C, there would be no land available for potash development. Therefore, no AUMs would be removed due to potash development.

Impacts from Alternative D

Impacts to livestock grazing resulting from potash processing facilities would be the same as Alternative B1.

4.12.4 Fiscal Impacts

Management actions under the plan alternatives have the potential to affect revenues accruing to local governments. These revenues can include mineral lease payments, property taxes, tourist-related taxes (transient room, resort community, restaurant, car rental), and sales taxes from purchases of goods and services by businesses, their employees, and visitors. The following discussion focuses on the fiscal impacts from oil and gas development, potash development and recreation. The fiscal impacts from livestock grazing under the plan alternatives are discussed but are negligible. Where possible, quantitative estimates are provided; otherwise, a qualitative presentation is provided.

The following estimates were not run through the IMPLAN model. This is because tax revenues cannot be assigned to specific economic sectors. For example, property taxes typically accrue to taxing entities' general funds or to specific purpose funds such as schools. These funds can then be spent on a wide variety of goods and services, typically at the local taxing entity's discretion. Without knowing how and where these funds would be spent, IMPLAN-based sector analysis cannot be reliably performed.

Fiscal Impacts from Oil and Gas Development and Production

Assumptions

The fiscal impact analysis is based on the following assumptions for oil and gas development and production:

- Successful wells projected under the RFD can produce natural gas as well as oil. For the Planning Area, natural gas production is more variable than oil and can be more difficult to estimate. Additionally, natural gas prices are low, and will likely produce much less fiscal revenues than oil production. For this reason, the following analysis focuses on oil production. To the extent that significant quantities of natural gas are also produced and marketed, the fiscal impacts would be greater.

- Production of oil over the life of the plan is assumed to average 276 barrels per day for successful wells, based on wells coming on line between 2011 and 2014 in the Big Flat area of Grand County

(UDOGM 2014). Production could be significantly lower, as discussed below. This average is assumed to hold over the life of the plan, as new wells (typically with greater production) come on line, and older wells decline in production. Future average annual production from new wells within the Planning Area may be greater or less than this average.

- The market price per barrel of oil produced is assumed to be $99.30, based on the twelve month average price through September, 2014 (U.S. Energy Information Administration 2014), and will remain constant in 2014 dollars over the life of the plan. Lower (or higher) future prices will produce lower (or higher) fiscal impacts.

- Property taxes on new wells will average $33,272, the 2014 average property tax on wells in the Big Flat area (Carrol 2014). Estimated benefits are not broken out by county, as exact future well locations are unknown.

- Royalties on production will continue at 12.5 percent of market value, with approximately 25 percent of the royalties accruing to Grand and San Juan Counties.[2] Estimated benefits are not broken out by county, as exact future well locations are unknown.

- Bonus lease payments on new leases are not analyzed, as there is no reliable means to make this estimate.

- Annual lease rentals on parcels not in production are not analyzed, since the amounts are difficult to estimate and are small relative to royalties on production.

- Other minor State levied taxes on oil and gas production are not estimated. These amounts range from 0.2 percent of the value of production (conservation tax) to five percent for State severance taxes. The amounts collected, however, revert to the State's general fund, rather than directly to the counties of origin, making estimation of economic impacts to the Planning Area all but impossible.

- The analysis excludes any indirect fiscal impacts such as sales or property tax revenues resulting from local spending generated by new employment.

Table 4-38 and Table 4-39 describe the economic impacts of royalty and property tax payments from successful oil wells.

Table 4-38. Economic Impacts of Royalties from Production on Successful Oil Wells

Alternative	A	B1	B2	C	D
Successful Wells per Year	9.24	6.06	7.50	1.44	6.72
Present Value over Life of Plan (1,000s of $2014)					
Production	$9,716,801	$6,372,707	$7,887,014	$1,514,306	$7,066,764
Total Royalties	$1,214,600	$796,588	$985,876	$189,288	$883,345
Returned to Counties	$303,650	$199,147	$246,469	$47,322	$220,836
Average Annual Values (1,000s of $2014)					
Production	$739,457	$484,968	$600,208	$115,240	$537,787

[2] *See the Socioeconomic Baseline Report (2012c) for a full discussion of how mineral lease payments are calculated and distributed.*

Alternative	A	B1	B2	C	D
Total Royalties	$92,432	$60,621	$75,026	$14,405	$67,223
Returned to Counties	$23,108	$15,155	$18,756	$3,601	$16,805

Based on assumed production of 276 barrels per well per day and $99.30 per barrel market price. Higher or lower values will produce linearly proportionate higher or lower impacts.

Table 4-39. Economic Impacts of Property Taxes on Successful Oil Wells

Alternative	Present Value over Life of Plan	Annual Average
A	$32,318,490	$2,459,466
B1	$21,195,893	$1,613,027
B2	$26,232,540	$1,996,320
C	$5,036,648	$383,293
D	$23,504,356	$1,788,703

Assumes average annual property tax per successful well of $33,272.
Assumes wells come online as described in Table 4-27.

Summary of Fiscal Impacts by Alternative

The impacts summarized below depend on relatively high production estimates and a relatively high market price for oil. Lower (or higher) production and/or lower (or higher) market prices could produce significantly different results. For instance, average daily production for all Utah wells was 23.4 barrels in 2013 (UDOGM 2014). If Planning Area production averaged this amount, the impacts in Table 4-39 would be over 90 percent lower.

Impacts from Alternative A (No Action)

Under Alternative A, fiscal impacts from mineral lease payments to the Counties in the form of royalties on production could total over $303 million over the life of the plan. Property tax benefits could total over $32 million over the life of the plan.

Impacts from Alternative B1

Under Alternative B1, fiscal impacts from mineral lease payments to the Counties in the form of royalties on production could total over $199 million over the life of the plan. Property tax benefits could total more than $21 million over the life of the plan.

Impacts from Alternative B2

Under Alternative B2, fiscal impacts from mineral lease payments in the form of royalties on production could total over $246 million over the life of the plan. Property tax benefits could total more than $26 million over the life of the plan.

Impacts from Alternative C

Under Alternative C, fiscal impacts from mineral lease payments in the form of royalties on production could total over $47 million over the life of the plan. Property tax benefits could total over $5 million more than the life of the plan.

Impacts from Alternative D

Under Alternative D, fiscal impacts from mineral lease payments in the form of royalties on production could total over $220 million over the life of the plan. Property tax benefits could total more than $23 million over the life of the plan.

Fiscal Impacts from Potash Development and Production

Assumptions

The fiscal impact analysis is based on the following assumptions for potash development and production:

- Potash production wells and associated fiscal impacts depend on construction and operation of PPF. Construction and operation of such facilities may not be economically viable under current market conditions for potash. Without the associated PPF, the drilling and completion of potash production wells is unlikely to occur.

- PPF property tax impacts are extrapolated from current facilities for solar evaporation (Intrepid-Moab) and K2O estimates for crystallization facilities. A more complete analysis would accompany a site-specific EIS prior to approval of any such facilities. PPF operations expenditures summarized in Table 4-28 above include both production royalties and property taxes. They are separated out for the reader's convenience, but caution must be exercised to avoid double-counting.

- Production estimates are those presented earlier for potash. A market price of $287 per ton is assumed (Infomine.com, 2014). Production is assumed to be constant over the planning period and equal to plant capacity. In reality, production is not likely to reach capacity for some time after plant operations commence, since new potash production well drilling and completion would occur over the life of the plan. Therefore, production royalties are highly likely to be lower than presented here, at least until full production is achieved.

- Lower (or higher) future production and/or prices will produce lower (or higher) fiscal impacts.

- Property taxes on new potash production wells will average $33,272, the same as with oil and gas wells. Estimated benefits are not broken out by county, as exact future well locations are unknown.

- Property taxes on non-production wells are assessed at transitory property tax rates. The average annual levy, although based on factors other than productive capacity, approximates the levy on development wells described above (Swazey 2014). Non-development wells are assumed to incur property taxes for one year only for each well. To the extent that such wells have a taxable life exceeding one year, the benefits could be greater.

- Royalties on production will continue at 5 percent of market value, with approximately 25 percent accruing to Grand and San Juan Counties.[3] Estimated benefits are not broken out by county, as exact future well locations are unknown.

- Bonus lease payments on new leases are not analyzed, as there is no reliable means to make this estimate. Annual lease rentals on parcels not in production are not analyzed, since the amounts are difficult to estimate and are small relative to royalties on production.

[3] *See the Socioeconomic Baseline Report (2012c) for a full discussion of how mineral lease payments are calculated and distributed.*

- The analysis excludes any indirect fiscal impacts, such as sales or property tax revenues resulting from local spending generated from new employment.

- "Life of Plan" amounts represent the present value of annual amounts over the life of the plan at the OMB discount rate of 1.3 percent.

Table 4-40 estimates royalties from potash production over the life of the plan. Table 4-41 estimates property taxes on production facilities. Table 4-42 estimates property taxes on development potash wells over the life of the plan. Table 4-43 estimates property taxes on non-development potash wells over the life of the plan.

Table 4-40. Economic Impacts of Potash Production Royalties by Alternative

PPF type and capacity	Alternative					
	A		B1		D	
	Life of Plan	Annual Average	Life of Plan	Annual Average	Life of Plan	Annual Average
400K ton solar						
Royalty @ 5%	$77,768	$5,740				
Counties share @ 25% of above	$19,442	$1,435				
300K ton solar						
Royalty @ 5%			$56,497	$4,170	$56,497	$4,170
Counties share @ 25% of above			$14,124	$1,042	$14,124	$1,042
2M ton crystallization						
Royalty @ 5%	$388,842	$28,700				
Counties share @ 25% of above	$97,210	$7,175				
1M ton crystallization						
Royalty @ 5%			$194,421	$14,350		
Counties share @ 25% of above			$48,605	$3,587		
1.02M ton crystallization						
Royalty @ 5%					$198,309	$14,637
Counties share @ 25% of above					$49,577	$3,659

All figures in thousands of 2014 dollars.

Table 4-41. Economic Impacts of PPF Property Taxes by Alternative

PPF type and capacity	Estimated Property Taxes by Alternative					
	A		B1		D	
	Life of Plan	Annual Average	Life of Plan	Annual Average	Life of Plan	Annual Average
400K ton solar (1)	$59,613	$4,400				
300K ton solar (1)			$44,710	$3,300	$44,710	$3,300
2M ton crystallization (2)	$245,228	$18,100				
1M ton crystallization (3)			$122,614	$9,050		
1.02M ton crystallization (3)					$125,066	$9,231

(1) Extrapolated from Intrepid-Moab 2013 property tax levy of $1.1 million, and assumes proportionality.
(2) K2O estimate presented to San Juan County Commission (2010)
(3) Extrapolated from (2), and assumes proportionality.
(4) All figures in thousands of 2014 dollars

Table 4-42. Economic Impacts of Production Potash Well Property Taxes by Alternative

Alternative	Total Projected Wells	New Wells per Year	Property Taxes	
			Life of Plan	Annual Average
A	416	27.7	$58,201,263	$4,429,169
B1	216	14.40	$50,366,477	$3,832,934
D	228	15.20	$53,164,615	$4,045,875

Assumes wells are operative from year of completion through life of plan.
All figures in 2014 dollars.

Table 4-43. Economic Impacts of Non-production Potash Well Property Taxes by Alternative

Alternative	Total Projected Wells	New Wells per Year	Property Taxes	
			Life of Plan	Annual Average
A	133	8.9	$3,996,971	$295,012
B1	72	4.8	$2,163,773	$159,706
D	72	4.8	$2,163,773	$159,706

Assumes wells are operative for one year.
All figures in 2014 dollars.

Summary of Fiscal Impacts by Alternative

The impacts summarized below depend on the economic viability of potash production in the Planning Area in the current market environment. The majority of the property tax impact is based on K2O's

estimates presented to San Juan County in 2010 for its crystallization proposal. For PPFs, site-specific EIS-level analyses would provide a more refined analysis.

Impacts from Alternative A (No Action)

Under Alternative A, fiscal impacts from mineral lease payments to the counties in the form of royalties on production could total over $116 million over the life of the plan. Property tax benefits could total over $367 million over the life of the plan. These amounts represent the sum of impacts from Table 4-40 through Table-43.

Impacts from Alternative B1

Under Alternative B1, fiscal impacts from mineral lease payments to the counties in the form of royalties on production could total over $62 million over the life of the plan. Property tax benefits could total over $219 million over the life of the plan. These amounts represent the sum of impacts from Table 4-40 through Table 4-43.

Impacts from Alternative B2

Under Alternative B2, potash development on Federal mineral estate in the Planning Area would not occur, and there would be no fiscal impacts.

Impacts from Alternative C

Under Alternative C, potash development on Federal mineral estate in the Planning Area would not occur, and there would be no economic impacts.

Impacts from Alternative D

Under Alternative D, fiscal impacts from mineral lease payments to the counties in the form of royalties on production could total over $63 million over the life of the plan. Property tax benefits could total over $225 million over the life of the plan. These amounts represent the sum of impacts from Table 4-40 through Table 4-43.

Fiscal Impacts from Recreation

Assumptions

The following analysis is based on the following assumptions for recreation:

- Spending by recreationists and tourist to the Planning Area and socioeconomic study area will increase proportionately to increases in overall visitation, assumed to average 3.1 percent annual growth.[4]

- Tourism-related tax collections will continue to increase at this same rate. Taxes related to tourism include the following:
  - transient room taxes (city and County)
  - resort community taxes
  - restaurant taxes

[4] *It is possible that the growth in tourist-related tax collections will exceed this annual visitation growth assumption, given that demand for services, especially lodging, may be outpacing the supply. For example, according to an article in the October 29, 2014 edition of the Moab Sun-News, Grand County transient room tax collections (TRT) increased by 14 percent in the first half of 2014, compared to the prior period.*

– car rental taxes

To the extent that these taxes reflect spending by other than tourists and recreationists, the impacts would be less.

- The analysis excludes items such as sales taxes on goods and services purchased by recreationists and tourists, as well as property taxes on tourist-related businesses and second homes. Given the size of the recreation economy in the socioeconomic study area, these amounts are likely large, but they are difficult to segregate from other activities.

- The analysis excludes any indirect fiscal impacts such as sales or property tax revenues resulting from local spending generated by new employment. Given that employment related to recreation and tourism dominates the local economy (especially in Grand County), these impacts are likely very large.

- Tourists and recreationists visit Grand and San Juan Counties to take advantage of activities offered not only on BLM lands, but also on National Park Service, Forest Service and State lands. It is likely that many visitors avail themselves of these multiple opportunities during their visit, rather than restricting their activities to a single jurisdiction. Similarly, visitors to BLM-managed lands likely do not restrict their activities to only lands encompassed in the Planning Area. Visitors en-route to these other areas, however, may find themselves passing through the Planning Area, including visitors to such popular attractions as Canyonlands National Park and Dead Horse Point State Park. Given the difficulties inherent in disaggregating this visitation and associated spending, the analysis will examine the impacts of *total* visitation to the two counties. The resulting analysis will likely overstate those impacts directly related to the Planning Area.

Table 4-44 presents the estimated fiscal impacts from recreation based on the assumptions noted above. The amounts for Fiscal Year 2013 are actual collections as reported in the Utah Tax Commission FY 2013 Annual Report. The data in the table assumes that recreation visitation will continue to increase at an annual rate of 3.1 percent, with a corresponding annual increase of the same percentage for all taxes listed. As discussed above, there is no attempt to separate out these tax collections by purpose of visit (e.g., NPS vs. BLM vs. commercial travelers).

Table 4-44. Estimated Fiscal Impacts from Recreation

Tax Source	FY 2013 [1]	Life of Plan [2]	Annual Average [2]
Grand County Motor Vehicle Leasing	$61,355	$1,174,996	$79,012
Grand County Restaurant	$390,121	$7,471,120	$502,389
Grand County Transient Room	$2,095,866	$40,137,463	$2,699,008
Moab City Resort Communities Sales	$2,780,852	$53,255,477	$3,581,117
Moab City Transient Room	$702,249	$13,448,614	$904,340
Monticello City Transient Room	$18,962	$363,137	$24,419
San Juan County Restaurant	$81,119	$1,553,492	$104,463
San Juan County Transient Room	$530,765	$10,164,562	$683,507
Total	**$6,661,289**	**$127,568,861**	**$8,578,255**

[1] Utah State Tax Commission 2014
[2] Life of Plan and Annual Average data are in 2014 dollars and discounted at a rate of 1.3 percent over the life of the plan.

Summary of Fiscal Impacts

The impacts summarized above depend on the continued growth of recreation and tourism on BLM lands in the Planning Area. The BLM expects this to occur across all alternatives, while recognizing the concern among some stakeholders that adoption of Alternative A could reduce the rate of increase or even displace visitors to other areas. The impacts summarized above are based on all recreation and tourism to Grand and San Juan Counties. The actual impacts on the two-county socioeconomic study area will likely be less, since visitors do not limit their recreation activities (and associated spending) to BLM lands, let alone the Planning Area itself. On the other hand, the estimated fiscal impacts do not include property taxes on tourism and recreation-connected businesses nor sales taxes connected to spending in the local economy, whether by visitors or local employees of recreation-based businesses. As discussed earlier, these impacts could be quite large. Based on the assumptions noted above, recreation-related tourism and fiscal benefits are expected to total more than $127 million (in 2014 dollars) over the life of the plan, averaging over $8.5 million annually. Most of this is expected to come from taxes collected in Moab City and Grand County.

Fiscal Impacts from Livestock Grazing

Grazing fees and surcharges from use of BLM-administered lands generate some revenue for the Federal and local governments. Of the grazing revenues collected, 50 percent goes to the BLM Range Improvement Fund and is distributed to BLM District Offices according to their grazing receipts, 37.5 percent goes to the U.S. Treasury General Fund, and 12.5 percent goes to the state of origin and is distributed to local grazing boards. Grazing fees are set annually by the Secretary of the Interior, according to the provisions of 43 CFR 4130.8-1. The fee in 2014 was $1.35 per AUM. Additional surcharges occur if the livestock using BLM forage is not owned by the permittee or the permittee's children. This is not common in the Planning Area. The average total grazing fee in a given year for the Planning Area may exceed $1.35, but not to a degree that material affects the fiscal impact of the alternatives. Given the small number of AUMs potentially lost under any of the alternatives, the fiscal impacts of the alternatives due to loss of forage are negligible.

4.12.5 Nonmarket Value Impacts

Nonmarket values include the economic benefits to local communities from the amenity values provided by open space and scenic landscapes, the economic benefits to individuals such as the unpriced value recreationists experience from their activities and ecosystem service values, which are the ways that healthy ecosystems support, enable, or protect human activity. Potential impacts to each are considered in turn below.

As noted in the Socioeconomic Baseline Report, amenity values are of critical importance to Moab, the surrounding area, and the socioeconomic study area as a whole. Open space, including multiple-use BLM and USFS lands and the protected landscapes of National Parks in the area, provides scenic values and opportunities for outdoor-based recreation that have drawn visitors, second home owners, and permanent transplants to the area, generating economic activity and supporting property values. These economic benefits are difficult to quantify, but they clearly exist (Sonoran Institute 2004, The Wilderness Society 2007, Venturoni, Long, and Perdue 2005, Francese 2003). It is also difficult to attribute these benefits directly to particular actions of land management agencies. However, it is possible for natural resource development on public land—particularly large-scale development—to result in degradation of scenic values, recreational opportunities, and other aspects of open space that contribute to these nonmarket, amenity-based economic values.

Outdoor recreational opportunities are known to provide unpriced value to individual recreationists (Rosenberger 2011). As with the broader benefits derived from amenity values, these nonmarket values

experienced by individuals can be degraded by mineral development on public land, depending on the scale and nature of such development.

Ecosystem service values—the economic benefits provided by ecosystem functions—can be negatively impacted by mineral development. This would occur if such development reduces the availability or quality of ecosystem functions.

Relative risks to these nonmarket values can be assessed, based on the level of mineral development that could occur under each of the alternatives considered by this plan. For example, Alternative A has the greatest potential to negatively impact scenic viewsheds due to the scale of mineral development, especially potash processing facilities, and due to the relative lack of constraints and protective requirements on development under this alternative (see Section 4.19—Visual Resource Management/Auditory Management (Soundscapes) for additional discussion). These impacts could be broad and permanent due to the wide-open nature of the Planning Area, the fragility of much of the landscape, and the potential intensity of development of mineral extraction and processing facilities and associated infrastructure, particularly for potash. Such impacts could affect (reduce) both the general economic benefits of viewshed amenities and the specific economic benefits experienced by individual recreationists from viewsheds. The potential impacts on ecosystem service values would depend on the specific locations and effects of mineral development; for instance, whether riparian zones are affected by surface disturbance in ways that could impact water flows or water quality to the detriment of communities downstream. However, given the relative lack of constraints and protective requirements on mineral development under Alternative A, the potential for impacts to ecosystem services is also greatest under Alternative A compared to the other alternatives.

While Alternative A has the greatest potential for negative impacts to non-market values, Alternative C has the least potential for such impacts. This is because of the considerably reduced level of mineral development projected in Alternative C potash mineral development would not occur, and oil and gas development would be substantially less. Alternative B2 would have a greater, but still low relative potential for negative impacts to non-market values; it allows for a higher level of oil and gas development, but does not allow for potash development.

Relative to Alternative A, Alternative B1 would have less potential for negative impacts to non-market values because potash development is reduced and subject to greater controls under this alternative. Alternative D would have less potential for negative impacts to non-market values than Alternative A, and similar impacts to Alternative B1. Alternative D would have greater potential for negative impacts to non-market values than Alternative C and somewhat greater potential for such impacts than Alternative B2.

4.12.6 Social Impacts

In general, social impacts of BLM management actions are of two primary types:

- Social impacts driven by economic impacts – For instance, such impacts may occur when changes in employment due to management decisions lead to changes in population that drive impacts to housing, schools, community services, crime, community cohesion, etc.

- Social impacts that are more purely social and cultural in nature – These include impacts on amenity values, traditional land uses and associated cultural values, attitudes and beliefs, and other intangible aspects of quality of life.

The next two subsections address each type of social impact.

Social Impacts Driven by Economic Impacts

The degree of mineral development varies by alternative. Such development has the potential to affect community services, local sense of place, community cohesion, and other social conditions by generating new employment and drawing new population to the socioeconomic study area, particularly in proximity to the Planning Area, including the Moab area.

It is thus useful to place into context the potential employment increases that could result from development of oil and gas and potash resources under some of the management alternatives, as estimated in Section 4.8. Table 4-45 shows the total jobs (direct, indirect, and induced) that would be generated by mineral development under each alternative. With respect to recreation, none of the alternatives are likely to result in increases in employment beyond the increases resulting from the current growth rate for recreation visitation. Decreases in recreation visitation and associated employment are possible, but not predicated, and any such decreases are likely to be small. Thus no disruptions to community services and social patterns are likely from the plan's impacts on recreation. Employment related to livestock grazing is very unlikely to change much under any of the alternatives.

Table 4-45. Total Annual Jobs Generated by Mineral Development, by Alternative

	A	B1	B2	C	D
Oil and Gas Well Development	211	145	180	34	161
Oil and Gas Well Operation	14	9	11	3	10
PPF Development	3,005	1,747	0	0	1,747
PPF Operation	247	143	0	0	143
Potash Well Development - Non-Production Wells	127	69	0	0	69
Potash Well Development - Production Wells	329	161	0	0	172
Potash Well Operation	34	16	0	0	18
Totals	**3,967**	**2,290**	**191**	**37**	**2,320**

Source: Estimates per tables in Section 4.12.4.
Note: PPF development jobs would occur only during the construction period; all other jobs are annual average jobs across the 15-year life of the plan. Jobs from construction of infrastructure ancillary to PPFs (roads, pipelines, power lines, railroad spurs) are not included in the PPF development jobs estimates.

To place the figures shown in Table 4-45 into context, Table 4-46 shows the total jobs in each county of the study area in 2009 and the growth in jobs from 2000 to 2009.

Table 4-46. Total Study Area Jobs 2009 and Job Growth 2000-2009

Grand County		San Juan County		Study Area	
Total Jobs 2009	Change 2000-2009	Total Jobs 2009	Change 2000-2009	Total Jobs 2009	Change 2000-2009
6,687	1,002	6,376	1,167	13,063	2,169

Source: Socioeconomic Baseline Report, Tables 4-1 and 4-2.

As shown by the two tables above, the new jobs generated under Alternatives B2 and C (191 and 37, respectively) would represent small fractions of both the total jobs in the socioeconomic study area in 2009 (13,063) or the change in total jobs from 2000 to 2009 (2,169). It is likely that the area's community services and social systems could readily absorb this level of new jobs and any associated population gain.

In contrast, the number of new jobs generated under Alternative A (3,967) is considerably greater than the change in total jobs from 2000 to 2009 (2,169). While the comparative number would be greater if a 15-year period were considered (equivalent to the life of the plan), the estimated employment under Alternative A represents a large number of additional jobs relative to historical job growth rates, and the associated population increase from in-migration necessary to fill this many jobs could be substantial. It is important to keep in mind that the increase in jobs and population would mostly be in addition to the natural rate of increase in the absence of the mineral development allowed by the plan. Therefore, the socioeconomic study area would have to absorb the natural rate of job growth and an equivalent or higher number of jobs for mineral development. The resulting population increase, and the level of stress it might place on community services and social systems in the study area, cannot be readily projected, but there is a very real possibility that stresses could occur. Social impacts are likely in part because the employment and population increases would be substantial compared to the employment and population base of the socioeconomic study area (e.g., 3,967 new minerals-related jobs, plus natural increase of several thousand jobs over 15 years, on a base of 13,063 jobs in 2009).

A few additional factors are relevant here. First, much of the employment would be located in or in close proximity to the Planning Area. While long-distance commuting is not uncommon in the socioeconomic study area, many people who fill the new jobs would want to live near the Planning Area. Much of the demand for community services and much of the stress on social systems (e.g., increased traffic, bidding up of housing prices, new residents unfamiliar with local customs and culture, etc.) would occur in and around Moab. Moab has a much smaller employment base than that of the full two county socioeconomic study area as shown in Table 4-46; therefore, the localized impacts would be greater than the comparison of new job generation to two-County total jobs and job growth indicates. Second, much of the job generation shown in Table 4-45 is due to PPF construction. These jobs would be temporary—they would be needed over a multi-year period, but not for the life of the plan or beyond. Thus a "boom" in jobs due to this construction surge could be followed by a "bust," as the employees required for construction lose those jobs and move on to other areas. Community services might need to be increased during the PPF construction period, and then reduced afterward, with the possibility that some community assets built to handle the construction boom would no longer be needed but might still be fiscal liabilities to local governments. Third, the job estimates in Table 4-45 do not include jobs from construction of infrastructure ancillary to PPFs (roads, pipelines, power lines, railroad spurs). The job requirements for this infrastructure, and associated population increases could be substantial and would also be temporary. In short, the potential for stresses on community services and social systems due to employment and population growth is understated by the figures shown Table 4-45 and Table 4-46.

It is not possible to more precisely estimate the employment generation or population impacts of Alternative A and assess the resulting social impacts, given the many uncertainties around minerals development, as well as the lack of available information on the economics of potash development. Further assessment would be necessary through a project-specific EIS, should mineral development proceed under the Moab MLP.

The two other alternatives, Alternative B1 and Alternative D, have minerals-related employment generation estimates of 2,290 and 2,320 respectively. The estimates for these alternatives are somewhat lower than the estimate for Alternative A. The potential exists under these alternatives for employment-driven population gains to lead to population increases that are substantial enough to cause social impacts.

Other Social Impacts

Regarding impacts that are more purely social and cultural in nature, the four high-level stakeholder categories identified and described in the Attitudes and Beliefs section of the Socioeconomic Baseline Report are used below to assess key social impacts of the alternatives. Stakeholders have distinct sets of attitudes, beliefs, values, opinions, and perceptions about public lands and the effects of various management policies and actions. These views reflect different cultural and economic linkages people have to public lands. By looking at the alternatives from different points of view, one can identify potential social and cultural impacts on each stakeholder group. The categorization of stakeholders is not meant to imply that all individuals and social groups fit neatly into a single category; many specific individuals or organizations may have multiple interests and would see themselves reflected in more than one stakeholder category. The point of the categories used here is to allow differentiation of social impacts based on broad differences in sociocultural linkages to public lands and associated points of view.

Impacts from Alternative A (No Action)

Habitat and Resource Conservation Stakeholders would find Alternative A unsatisfactory and the least favorable of all the alternatives. These stakeholders believe protecting species and ecosystems is a fundamental social value, and is not sufficiently accomplished by the current policies carried forward by Alternative A. They believe the level of resource development allowed under Alternative A would be too high, and the level of protection of species and ecosystems in the face of this development would be too low, and therefore, this alternative would be detrimental to sensitive species and essential habitats. Members of this stakeholder category are also concerned with protection of water, air, and soil resources. They would be concerned that the level of potash development in this alternative could reduce or harm limited water supplies. They would be concerned with erosion and introduction of invasive plants due to surface-disturbing activities associated with oil and gas, and potash development. This stakeholder category also includes persons interested in the conservation of geological, paleontological, archaeological, and cultural resources, who generally would not favor this alternative based on a view that current management does not adequately protect these resources in the face of substantially increased development.

Recreation Stakeholders would find Alternative A unsatisfactory and the least favorable of all the alternatives. They believe the level of mineral resource development under this alternative would lead to degradation and loss of recreational use values, particularly without additional requirements to mitigate such degradation. These views are tied to concern for protection and enjoyment of scenic viewsheds, natural soundscapes, and the flora and fauna of the area, all of which would be seen by these stakeholders as vulnerable to impacts from resource development under this alternative.

Mineral Development and Production Stakeholders would find Alternative A the most favorable of all the alternatives. This alternative allows the highest levels of mineral resource development. It also imposes the fewest constraints and requirements; this would facilitate resource development and reduce its costs. These stakeholders would see this alternative as providing the highest level of opportunities for creating high-paying mineral development and production jobs to benefit the local area, and maximizing benefits to the nation from the area's energy minerals and relatively unique potash resources.

Visual Resource Stakeholders would find Alternative A unsatisfactory and the least favorable of all the alternatives. These stakeholders believe the visual resources in and around the Planning Area are a unique and valuable asset locally, nationally, and internationally, and emphasize that the visual integrity of the area should be maintained. They would be concerned that the level of resource development under this alternative—especially without significant additional protections—would degrade the region's sight lines and visual resources directly due to alteration of the landscape, and indirectly due to air quality impacts, light pollution, and changes to vegetation due to development.

Impacts from Alternative B1

Habitat and Resource Conservation Stakeholders would find Alternative B1 preferable to Alternative A. The levels of resource development allowed under this alternative are somewhat reduced compared to Alternative A, and separating potash development from oil and gas development would reduce surface impacts by eliminating redundant infrastructure and ensuring orderly development, which would result in reduced impacts on many of the resources of concern to stakeholders in this group. However, they would still have concerns that substantial impacts could occur under this alternative.

Recreation Stakeholders would find Alternative B1 preferable to Alternative A. Reduced levels of development and separation of potash development from oil and gas development would tend to reduce impacts on recreation. Designating PLAs (103,619 acres) could reduce the quality of recreation experiences in the Red Wash, Upper Ten Mile, and Hatch Point areas if potash is developed. However, designating these areas would eliminate the possibility of potash development impacts to the recreation settings in the remainder of the Planning Area. In addition, not issuing new oil and gas leases within the PLAs could help to reduce impacts to recreation found within these areas. However, they would still have concerns that substantial impacts could occur under this alternative.

Mineral Development and Production Stakeholders would find Alternative B1 less preferable than Alternative A, due to its reduced levels of resource development and restrictions on some aspects of resource development.

Visual Resource Stakeholders would find Alternative B1 preferable to Alternative A. They would find the reduced levels of resource development and restrictions on resource development to be improvements over Alternative A. However, they would still have concerns that the levels of resource development allowed under this alternative could potentially degrade the visual resources in and around the Planning Area.

Impacts from Alternative B2

Habitat and Resource Conservation Stakeholders would find Alternative B2 preferable to Alternative A and relatively favorable overall. By not allowing for potash development and somewhat reducing the level of oil and gas development, this alternative would result in reduced impacts on many of the resources of concern to stakeholders in this group.

Recreation Stakeholders would find Alternative B2 preferable to Alternative A, and relatively favorable overall. By not allowing for potash development and somewhat reducing the level of oil and gas development, this alternative would reduce surface disturbance, alteration of sight lines, and other changes that could degrade recreational experiences.

Mineral Development and Production Stakeholders would find Alternative B2 less preferable than Alternative A or Alternative B1. In particular, members of this group who are interested in potash development would find this alternative unsatisfactory because it does not allow for potash development. However, those who are interested in oil and gas development would favor this alternative over the other action alternatives as the reductions on this development are the lowest of any of the action alternatives.

Visual Resource Stakeholders would find Alternative B2 preferable to Alternative A and relatively favorable overall. It does not allow for potash development, which this stakeholder group sees as particularly impactful on sight lines and other aspects of visual resources. It has only a slightly reduced level of oil and gas development than Alternative A; therefore, these stakeholders would see this alternative as less favorable that Alternative C.

Impacts from Alternative C

Habitat and Resource Conservation Stakeholders would find Alternative C the most favorable of all the alternatives. This alternative provides for the lowest levels of mineral resource development and the highest levels of protection of sensitive resources. Thus it is the alternative that is most aligned with the concerns and interests of this stakeholder group.

Recreation Stakeholders would find Alternative C the most favorable of all the alternatives. By providing for the lowest levels of mineral resource development, this alternative has the least potential for degradation of recreation resources.

Mineral Development and Production Stakeholders would find Alternative C unsatisfactory and the least favorable of all the alternatives. It does not allow for potash development and has the lowest level of oil and gas development, at a substantially reduced level compared to the other alternatives. Members of this stakeholder group would see this alternative as foregoing substantial opportunities to economically benefit the region and nation by developing the energy minerals and relatively unique potash resources of the Planning Area.

Visual Resource Stakeholders would find Alternative C the most favorable of all the alternatives. It does not allow for potash development, which this stakeholder sees as particularly impactful on sight lines and other aspects of visual resources. It also has the lowest level of oil and gas development, thereby providing the least chance of impacting visual resources, according to these stakeholders.

Impacts from Alternative D

Habitat and Resource Conservation Stakeholders would find Alternative D similar to Alternative B1 in terms of the levels of resource development. However, they would find it somewhat preferable to Alternative B1 because of various additional protections included under Alternative D. For instance, protections for lands adjoining Arches and Canyonlands National Parks would reduce impacts on resources of concern to stakeholders in this group compared to Alternative B1, and would be seen as considerable improvements relative to Alternative A.

Recreation Stakeholders would find Alternative D similar to, but generally preferable to Alternative B1. Alternative D has similar levels of resource development but includes various additional protections that would reduce the likelihood or level of degradation to recreation experiences. They would see Alternative D as a considerable improvement relative to Alternative A.

Mineral Development and Production Stakeholders would find Alternative D somewhat similar to Alternative B1 in terms of the levels of resource development. They would find it somewhat preferable to Alternative B1 because Alternative D provides more flexibility for mineral leasing and development. However, they would still find Alternative D less favorable than Alternative A.

Visual Resource Stakeholders would find Alternative D similar to, but generally preferable to Alternative B1, primarily due to the increased protection of NPS viewsheds. Alternative D has similar levels of resource development but includes various additional protections that would reduce the likelihood or level of degradation to visual resources. They would see Alternative D as a considerable improvement relative to Alternative A.

4.12.7 Environmental Justice Impacts

Under the Executive Order on Environmental Justice, each Federal agency must identify and address "disproportionately high and adverse human health or environmental effects of its programs, policies, and

activities on minority populations and low-income populations" (EO 12898, §59 *Federal Register* 7629, 1994). Environmental effects include economic effects, such as costs imposed on persons in proximity to a Federal action. Based on the EJ screening criteria and analysis presented in the Socioeconomic Baseline Report, no places (incorporated and unincorporated communities or population clusters) in Grand County meet the criteria for potential EJ populations based on minority population and population in poverty. Several places in San Juan County meet the criteria for potential EJ populations based on minority population (American Indian) and/or population in poverty. In addition, the Navajo Nation is a potential EJ population due to its status as an Indian reservation. Distributed populations of American Indians or persons in poverty, or workers of similar status, could be considered EJ populations if they are subject to disproportionate adverse impacts.

The potential for any alternative in the MLP/FEIS to have disproportionately high and adverse human health or environmental effects on these populations is low. "Disproportionate" and "adverse" are the key concepts in this assessment. An EJ impact only exists if the impact on the identified population is harmful, *and* "appreciably exceeds or is likely to appreciably exceed" the impact to the general population or other appropriate comparison group. The reasoning for a finding of low potential for EJ impacts is as follows:

- There are no EJ populations within or in close proximity to the Planning Area. The closest community identified as having an EJ population is Blanding, which is located more than 20 miles from the Planning Area. Thus, there is very little potential for direct, adverse human health or environmental effects on any place-based EJ population (e.g., from dust, noxious fumes, noise, traffic through EJ neighborhoods, etc.).

- It is unlikely, and unprovable at the planning level of this MLP/FEIS, that workers serving mineral development in the Planning Area who have EJ population status (e.g., American Indians) would be disproportionately subjected to human health risks in the workplace compared to other workers who are not members of EJ populations.

A project-level EIS would further assess the potential for EJ impacts for specific actions proposed under the final plan.

4.13 SOIL AND WATER

This section presents potential impacts to soil and water resources from implementing management actions presented in Chapter 2. Existing conditions concerning soil and water resources management are described in Chapter 3.

Assumptions

- For the purposes of this analysis, water erosion is the primary mechanism for loss of soil productivity.
- For purposes of this analysis, wind and water erosion are the primary mechanisms for loss of soil productivity.
- Wind erosion can impact soil productivity in a similar manner as water erosion.
- Eroded soil can be deposited as sediment at any point downslope or can be transported to the drainage network, and ultimately, water bodies such as streams, rivers, lakes, and reservoirs.
- The amount of sediment from upland soil erosion that is transported to streams and other water bodies is dependent on distance to the water body, slope, soil texture, filtering capacity of upland and riparian vegetation, storm intensity, duration, and runoff generated.
- The removal of vegetation or biological soils crusts increases soil susceptibility to erosion via wind and water erosion by decreasing soil strength, reducing infiltration, increasing runoff, altering soil structure, and reducing protection of the surface from raindrop impact.
- Vegetation and biological soil crust increase soil organic matter, aggregation of soil particles, and soil porosity, all of which increase soil resistance to erosion.
- Management actions that mitigate adverse impacts to soil and vegetation resources would help minimize soil erosion and sediment, salt, and excess nutrient loading to water bodies.
- Short-term erosion impacts depend on soil texture and type, porosity and permeability, landscape position, slope of the land, magnitude and type of disturbance, type of vegetation, and the length of time it takes for the disturbed area to become revegetated with a self-sustaining, perennial plant community.
- Long-term erosion impacts are those impacts that continue after vegetation has become re-established. They are due in part to changes in the vegetation community but to a greater extent to a surface area that remains void of vegetation, such as pads and roads.
- The State of Utah has primacy with regard to management of water quality and distribution of water (quantity). The BLM manages the public lands within the Planning Area. The management of these lands can affect the quality, quantity, and timing of flows of the waters through them. Because the State must comply with Federal laws, compliance with State laws includes compliance with Federal rules and regulations, including the Clean Water Act, Colorado River Salinity Compact, Safe Drinking Water Act, and others. Therefore, it is assumed that any discharged water would meet water quality standards at the point of discharge.

- Water flows down gradient. Larger volumes of material of greater sizes can be carried as flow volume and velocities and increased.

- Degradation of stream channel and land health conditions can be quite rapid, for example, during a single, large flood event. Recovery is often a much slower process. It is generally more efficient to prevent degradation in the first place, rather than to recover a degraded system.

- Any activities that affect the ecological condition of the watershed and its vegetative cover would directly or indirectly affect the aquatic environment. The degree of impact attributed to any one disturbance or series of disturbances is influenced by location within the watershed, time and degree of disturbance, existing vegetation, and hydrologic condition.

4.13.1 Soil Resources

Impacts Common to All Alternatives

There are no impacts to soil resources that are common to all alternatives.

Impacts from Alternative A (No Action)

Under Alternative A, both oil and gas leasing and potash leasing could occur concurrently on the same tract of land, which could result in higher concentrations of development and redundant infrastructure. Although drilling for oil and gas and potash is similar, the production of potash requires the use of potash processing facilities, which involve large tracts of land over a long period of time. Any mineral (potash and oil and gas) activities that occur would result in surface disturbance, which in turn could result in removal of vegetative cover, soil compaction, reduced infiltration, changes in physical and biological properties, reduction in organic matter content, reduced productivity, and increased erosion rates due to the exposure of soil particles to wind and water.

Linear disturbances such as roads and pipelines can have adverse impacts on soils, hydrologic functions, and hillslope/geomorphic processes. Impacts from this type of disturbance can include interception/diversion, concentration, and re-routing of surface and sub-surface flows, reduced infiltration and increased runoff. The combination of concentrated flows, exposure of erosive soils in the road prism (road surface, and cut/fill surfaces), surface rutting, and stream crossings can lead to gully formation and increases in erosion and stream sedimentation. The type and extent of impact is dependent on soil properties and conditions, landscape location (i.e., ridge-top or midslope), and road parameters such as construction design (inslope, outslope, drainage features), road surface condition, road gradient/grade length, and use levels/seasons.

Potash processing facilities would be allowed throughout the portion of the Planning Area (651,240 acres), not managed with an NSO stipulation or closed, which would result in vegetation loss and soil disturbance in the short term, during initial construction activity of processing facilities. Long-term impacts could also occur in areas where soils have become exposed or compacted, thereby increasing susceptibility to wind and water erosion.

Approximately 210,884 acres would be managed as open to mineral leasing in Alternative A, subject to standard terms and conditions. Oil and gas development would involve land-clearing and surface disturbances, such as the construction of well pads, roads, and pipelines in these areas. These actions remove and disturb vegetation, expose soils to the erosive forces of water and wind, and result in soil erosion and reduction of soil productivity in both the short-term, during construction activities, and in the long-term, as permanent structures, such as well pads and roads are maintained. Similarly, potash development would involve construction of well pads, roads, pipelines, processing facilities, and other

surface disturbances in both the short-term and long-term, which could lead to soil erosion, compaction, loss of productivity, increased runoff and transport of salt and sediments.

Approximately 440,386 acres would be open to mineral leasing subject to CSU and TL stipulations in Alternative A. CSU and TL stipulations would minimize the amount of surface disturbance and resulting vegetation loss, soil erosion and compaction. Specifically, application of the CSU stipulation for mineral leasing on slopes greater than 30 percent (79,045 acres) within the Moab Field Office, requiring an erosion control plan on slopes between 21 percent and 40 percent within the Monticello Field Office (29,150 acres), and not allowing surface-disturbing activities on slopes greater than 40 percent (42,339 acres) within the Monticello Field Office unless no other alternative is available, would provide protections to susceptible soils on these slopes by limiting the amount of surface disturbance and increased erosion and runoff that would occur. Also, application of a TL stipulation for mineral leasing prohibiting surface-disturbing activities on 68,275 acres of moderately to highly saline soils from December 1 to May 31 would provide protections to these soils in the short-term during the timeframe the restriction was in effect. Outside this timeframe, however, drilling operations could occur, in which case soil erosion, compaction, and increased runoff could occur.

Applying an NSO stipulation for mineral leasing to 133,574 acres would preclude surface-disturbing activity associated with mineral leasing and subsequent soil erosion and runoff in these areas.

Closing areas to mineral leasing (753 acres) would prevent surface disturbance and help to maintain vegetative cover and soil stabilization.

Developing and incorporating BMPs for activities in saline and other sensitive soils, along with site-specific mitigation measures, would minimize impacts to soil resources, by maintaining vegetative cover and soil stabilization. Similarly, developing BMPs to address health and safety concerns associated with blowing dust along U.S. 191 and I-70 could provide indirect protections to soil resources in these areas by preventing wind erosion and fugitive dust, and help to maintain soil quality in these areas.

Establishing criteria for restricting activities during drought that would include no new surface-disturbing activities and requiring erosion control techniques/BMPs for surface-disturbing activities would minimize the amount of soil lost, particularly by wind erosion.

Impacts from Alternative B

Under Alternative B, maximizing the size of oil and gas lease parcels could indirectly minimize impacts to soil resources. The likelihood of redundant infrastructure would be reduced, which could in turn reduce the amount of surface disturbance associated with construction of this infrastructure (e.g., pipelines, well pads, and roads).

Applying the Baseline CSU to 208,185 acres in Alternative B1 and 222,289 acres in Alternative B2 could minimize impacts to soil resources in these areas by limiting the amount of surface-disturbing activities associated with mineral leasing and development, thereby maintaining vegetation, stabilizing soil, and limiting erosion. In addition, application of a CSU stipulation requiring compensatory mitigation outside the area of impact for any surface disturbance on saline soils (68,348 acres), and applying BMPs for soils, would minimize impacts to soil resources as compared with Alternative A.

Additionally, compared to Alternative A, applying a CSU stipulation for activities in Alternative B on slopes greater than 21 percent throughout the Planning Area would result in increased protections to soil resources, as the slope threshold would be less (21 percent compared to 30 percent for Moab and 21 percent to 40 percent for Monticello) and the CSU stipulation would cover the entire Planning Area (181,119 acres).

Applying NSO stipulations for mineral leasing and development in Alternative B would provide further protections to soil resources by preventing the surface-disturbing activities associated with mineral leasing and development, thereby maintaining vegetation, soil stabilization, and preventing erosion.

Implementing BMPs for soils to minimize potential runoff, soil erosion, and salt and sediment loading to water resources from mineral development would minimize impacts to soils resources from surface-disturbing activities, where soil-stabilizing vegetation is removed or damaged.

Applying BMPs in Alternative B to reduce fugitive dust in all soils and especially those with high and moderate wind erosion ratings would provide the same protections to soil resources as discussed in Alternative A, but to a greater extent as the area of application would be greater. In addition, applying BMPs during extreme and exceptional droughts to reduce dust production would provide protections to soil resources by minimizing the amount of soil lost by wind erosion, similar to Alternative A.

Application of BMPs for reclamation, soils and noxious weeds including requirements for seeding to improve soil stabilization or to prevent noxious or invasive weed species would indirectly benefit soil resources by minimizing soil loss and erosion.

Impacts Specific to Alternative B1 Only

Not issuing new oil and gas leases within PLAs (103,619 acres) could help to minimize adverse impacts to soil resources by limiting the amount of surface disturbance within the PLAs. These adverse impacts could result from the concurrent oil and gas development and potash development, which could occur under Alternative A. However, 43 percent of the Hatch Point PLA contains existing oil and gas leases. Therefore, there is potential for concurrent development of oil and gas and potash on these existing leases and a greater likelihood for adverse impacts to soil resources over the next 15 years in the Hatch Point PLA. Furthermore, if potash resources do not develop in that timeframe, the area could again be available for oil and gas leasing. If the acreage encompassed by PLAs were to become available solely for oil and gas leasing and development the adverse impacts to soil resources would be similar to or less than the impacts identified for potash leasing and development. Alternative B1 does not allow potash leasing on 681,948 acres within the Planning Area, which would minimize adverse impacts to soil resources from concurrent oil and gas and potash development as compared to Alternative A.

PLAs would be identified in the Upper Ten Mile area (29,127 acres), the Red Wash area where potash prospecting permits have been issued (29,956 acres), and the Hatch Point area where potash prospecting permits have been issued (44,536 acres). The PLAs would total 103,619 acres. Designating these PLAs could impact soil resources within these areas. In these PLAs, surface-disturbing activities associated with potash leasing and development could occur and result in loss of vegetation, destabilization of soils, increased erosion, and greater sediment and salt runoff. A phased approach to potash leasing could help reduce impacts to soil resources as compared to Alternative A. By testing the feasibility of potash development, unnecessary surface disturbance would be avoided and appropriate mitigation measures applied. These measures would benefit soil resources.

Applying the CSU stipulation to all potash leases in Alternative B1 that requires processing facilities to be located within a PPFA (42,492 acres) would result in the same impacts to soil resources as those described in Alternative A. However, more facilities are expected in Alternative A, which would disturb 1,179 more acres of soil than that expected in Alternative B1 (from 4,216 acres of disturbance in Alternative A to 3,037 acres of disturbance in Alternative B1).

Under Alternative B1, there are zero acres open to mineral leasing subject to standard terms and conditions. This would reduce the amount of mineral development and the impacts to soil resources throughout the Planning Area as compared to Alternative A.

CSU and TL stipulations for oil and gas leasing would be applied to 228,926 acres in Alternative B1. While Alternative B1 has 221,430 fewer acres than Alternative A that are managed with CSU and TL stipulations, all of these acres are managed more restrictively (NSO and closed) in Alternative B1. Thus, Alternative B1 provides more protection to soils than does Alternative A.

An NSO stipulation for oil and gas leasing would be applied to 452,269 acres in Alternative B1. This is 318,695 acres more than Alternative A that are managed with an NSO stipulation. Therefore, Alternative B1 provides greater protection to soil resources than those provided in Alternative A. The acreage closed in Alternative B1 (753 acres) is identical to that in Alternative A and therefore, the impacts to soil resources are the same.

Within PLAs (103,619 acres), CSU and TL stipulations for potash leasing in Alternative B1 would be applied to 57,620 acres, while 45,999 acres would be subject to NSO stipulations. Therefore, surface disturbance to soils from potash well drilling would be restricted to 57,620 acres, which is 593,620 acres fewer than are available for potash well drilling in Alternative A. Projected potash well drilling in Alternative A amounts to 1,223 acres of surface disturbance and the projected potash development in Alternative B1 amounts to 647 acres of surface disturbance. Therefore, the potential impacts to soils is less in Alternative B1 than Alternative A.

Applying a TL stipulation for mineral leasing prohibiting surface-disturbing activities on moderately to highly saline soils from December 1 to May 31 would have similar impacts to soil resources discussed in Alternative A, but to a lesser extent as this stipulation would not apply to PPFAs (42,492 acres), so that surface-disturbing activities associated with construction of potash processing facilities could occur in these areas at any time of the year. However, applying a CSU stipulation within PPFAs requiring compensatory mitigation outside the area of impact for any surface disturbance on saline soils (18,360 acres) would help maintain widespread soil quality.

Impacts Specific to Alternative B2 Only

In Alternative B2, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would reduce impacts to soils that would result from the concurrent development of oil and gas and potash as described in Alternative A. The impacts to soils from the limited potash development provided in Alternative B1 would be greater than the exclusion of potash development in Alterative B2.

Alternative B2 would substitute oil and gas well drilling for potash well drilling within the PLAs established in Alternative B1 and the impacts to cultural resources would be similar. The major difference between Alternative B1 and Alternative B2 is that Alternative B2 eliminates the 3,037 acres of surface disturbance, and the associated potential adverse impacts to cultural resources that could result from the construction of potash processing facilities within the 42,492 acres of PPFAs established in Alternative B1.

Under Alternative B2, there are zero acres managed as open to oil and gas leasing subject to standard terms and conditions. This would reduce the amount of mineral development and the impacts to soil resources throughout the Planning Area as compared to Alternative A. Impacts to soil resources would be the same as those described in Alternative B1.

CSU and TL stipulations for oil and gas leasing would be applied to 285,806 acres in Alternative B2. While Alternative B2 has 154,580 fewer acres than Alternative A that are managed with CSU and TL stipulations, all of these acres are managed more restrictively (NSO and closed) in Alternative B2. Thus, Alternative B2 provides more protection to soils than does Alternative A and provides a similar amount of protection to soil resources as Alternative B1.

An NSO stipulation for oil and gas leasing would be applied to 499,008 acres in Alternative B2. This is 365,434 acres more than Alternative A that are managed with an NSO stipulation. Therefore, Alternative B2 provides greater protection to soil resources than that provided in Alternative A and provides a similar amount of protection to soil resources as Alternative B1. The acreage closed in Alternative B2 (753 acres) is identical to that in Alternatives A and B1; therefore, the impacts to soil resources are the same.

Applying a TL stipulation for mineral leasing prohibiting surface-disturbing activities on 68,275 acres of moderately to highly saline soils from December 1 to May 31 would provide the same protections to soil resources as discussed in Alternative A.

Impacts from Alternative C

In Alternative C, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would result in the same impacts to soils as those described in Alternative B2.

Applying the Baseline CSU stipulation (25,942 acres) for oil and gas leasing and development in Alternative C could reduce surface disturbance and associated impacts to soils when compared to Alternative A. Impacts to soil resources would be similar to Alternatives B1 and B2.

Maximizing the size of oil and gas leases in Alternative C would minimize impacts to soil resources as discussed in Alternative B. Maximizing lease size is not addressed in Alternative A.

Under Alternative C, there are zero acres managed as open to oil and gas leasing subject to standard terms and conditions. This would reduce the amount of mineral development and the impacts to soil resources throughout the Planning Area as compared to Alternative A. Impacts to soil resources would be the same as those described in Alternatives B1 and B2.

Alternative C applies CSU and TL stipulations to oil and gas leasing on 54,799 acres, which is much less acreage than Alternatives A (440,386 acres), B1 (228,926 acres), and B2 (285,806 acres). While Alternative C has fewer acres that are managed with a CSU or TL stipulation, these acres are managed more restrictively (NSO and closed). Thus, Alternative C provides more protection to soil resources than do Alternatives A, B1, and B2.

Applying an NSO stipulation in Alternative C to oil and gas leasing would prevent surface-disturbing activities from oil and gas development on 550,599 acres, which is 412,496 more acres as compared to Alternative A, and 51,511 acres more than Alternatives B1 and B2. Impacts to soil resources would be similar to those described under Alternatives A, B1, and B2, but would apply to a much larger area in Alternative C.

Under Alternative C, closing 180,169 acres to oil and gas leasing and development would preclude surface disturbance on 179,416 more acres than Alternatives A, B1, and B2. Impacts to soil resources would be similar to those described under Alternative A, but would apply to far more acres of soil resources.

Implementing BMPs in Alternative C to minimize potential runoff, soil erosion, and salt and sediment loading to water resources from mineral development would minimize impacts to soil resources as discussed in Alternative B. Applying BMPs to reduce fugitive dust in all soils and especially those with high and moderate wind erosion ratings would provide similar protections to soil resources as discussed in Alternative A, but to a greater extent, as the area of application would be larger, and the same impacts as those discussed in Alternative B. Applying BMPs during extreme and exceptional droughts to reduce dust

production would provide protections to soil resources by minimizing the amount of soil lost by wind erosion, similar to Alternative A and the same as Alternative B.

Application of BMPs in Alternative C to soil resources would provide the same protections to soil resources as discussed in Alternative B.

Impacts from Alternative D

Maximizing the size of oil and gas lease parcels would minimize impacts to soil resources as discussed in Alternatives B and C.

Implementing BMPs to minimize potential runoff, soil erosion, and salt and sediment loading to water resources from mineral development would minimize impacts to soil resources as discussed in Alternatives B and C.

Applying the Baseline CSU stipulation for all mineral development on 213,218 acres, could reduce surface disturbance when compared to Alternative A. Impacts to soil resources from the Baseline CSU stipulation would be the same as those described under Alternatives B and C. However, Alternative D provides an exception to the Baseline CSU stipulation that could result in additional development activity and associated impacts to soils from surface disturbance. Therefore, Alternative D provides less protection to soils than does Alternatives B and C.

Impacts to soil resources in Alternative D from limiting potash leasing to PLAs (103,619 acres) and implementing phased potash leasing are the same as those described in Alternative B1. Alternatives B2 and C do not provide for potash leasing and thus, would not result in adverse impacts to soil resources from potash development. Alternative D does not allow potash leasing on 681,948 acres within the Planning Area, which would minimize adverse impacts to soil resources from concurrent oil and gas and potash development as compared to Alternative A.

Designating a PLA in the Upper Ten Mile area, the Red Wash area where potash prospecting permits have been issued, and the Hatch Point area where potash prospecting permits have been issued would have the same impacts to soil resources as discussed under Alternative B1.

Applying the CSU stipulation to all potash leases in Alternative D that requires processing facilities to be located within a PPFA (42,492 acres) would result in the same impacts to soil resources as those described in Alternative B1. More facilities are expected in Alternative A, which would disturb 1,179 more acres of soil than that expected in Alternatives B1 and D. Alternatives B2 and C do not allow for potash leasing and development.

Under Alternative D, as in Alternatives B1, B2, and C, there are zero acres managed as open to oil and gas and potash leasing with standard terms and conditions as compared with the 210,884 acres in Alternative A. Therefore, Alternative D could result in the less damage or removal of soil resources as compared to Alternatives A.

Applying CSU and TL stipulations in Alternative D to oil and gas leasing on 230,675 acres would result in similar impacts to soil resources as those described in Alternatives B1 and B2. While Alternative D has 209,781 fewer acres than Alternative A that are managed with a CSU or TL stipulation, all of these acres are managed more restrictively (NSO and closed) in Alternative D. Thus, Alternative D provides more protection to soil resources than does Alternative A. While Alternative D has 175,966 more acres than Alternative C that are managed with a CSU or TL stipulation, the majority of these acres are managed more

restrictively in Alternative C. Thus, Alternative C provides more protection to soil resources than does Alternative D.

Applying an NSO stipulation in Alternative D to oil and gas leasing would prevent surface-disturbing activities from oil and gas development on 305,899 acres, which is 172,325 more acres as compared to Alternative A, but 245,700 acres fewer than Alternative C. While Alternatives B1 and B2 manage 146,390 more acres with an NSO stipulation as opposed to Alternative D, the majority of these 146,390 acres are managed as closed in Alternative D. Thus, Alternative D provides more protection to soil resources than do Alternatives A, B1, and B2, but less protection than Alternative C.

Alternative D provides an exception to the NSO for visual resources that could result in some additional mineral development and impacts to soils from surface-disturbing activities within VRM Class II areas. This exception could result in more impacts to soil resources from surface-disturbing activities than would be allowed in Alternative B1.

CSU and TL stipulations for potash leasing would be applied in Alternative D to 57,308 acres and would result in the same impacts to soil resources as those described in Alternative B1. Applying a CSU stipulation to all potash leases that requires processing facilities to be located within a PPFA (42,492 acres) would have the same impacts to soil resources as discussed in Alternative B1, apart from any area that would be granted an exception in the future. An exception to the PPFA stipulation could be granted for small-scale potash processing facilities located within the PLAs; if these small-scale potash processing facilities were constructed, impacts to soil resources would be greater than Alternative B1, due to greater surface disturbance (up to 100 acres). In Alternatives B2 and C, the Planning Area is closed to potash leasing and development resulting in greater protection to soil resources.

Applying an NSO stipulation to potash leasing on 45,999 acres would result in the same impacts to soil resources as those described in Alternative B1. Potash leasing and development is precluded in Alternatives B2 and C; therefore, impacts to soil resources from potash development are greater in Alternative D as compared to Alternatives B2 and C.

Applying a TL stipulation for mineral leasing in Alternative D prohibiting surface-disturbing activities on moderately to highly saline soils from December 1 to May 31 and applying a CSU stipulation within PPFAs requiring compensatory mitigation outside the area of impact for any surface disturbance on saline soils would provide the same protections to soil resources as discussed in Alternative B1. In addition, applying a CSU stipulation that requires compensatory mitigation outside the area of impact for any surface disturbance on saline soils (68,348 acres), and applying BMPs for soils, would provide the same protections to soil resources as discussed in Alternative B. Compared to Alternative A, applying a CSU stipulation for activities on slopes greater than 21 percent throughout the Planning Area would result in increased protections to soil resources, as the slope threshold would be less (21 percent compared to 30 percent for Moab and 21 percent – 40 percent for Monticello) and the CSU stipulation would cover the entire Planning Area (181,110 acres).

Applying BMPs in Alternative D to reduce fugitive dust in all soils, especially those with high and moderate wind erosion ratings, would provide similar protections to soil resources as discussed in Alternative A and the same as those described in Alternatives B and C. Furthermore, applying BMPs during extreme and exceptional droughts to reduce dust production would provide protections to soil resources by minimizing the amount of soil lost by wind erosion, similar to Alternative A and the same as Alternatives B and C.

Applying BMPs in Alternative D for reclamation, soils, and noxious weeds, including requirements for seeding to improve soil stabilization, would provide similar protections to soil resources as those described in Alternative A and the same protections to soil resources as discussed in Alternatives B and C.

4.13.2 Water Resources

Assumptions

A regulatory requirement applied to all oil and gas leases, regardless of management classification, is an obligation for all drilling operations to implement casing and cementing programs that are conducted in a manner that protects and/or isolates all usable groundwater zones.

Impacts Common to All Alternatives

Potential impacts on groundwater resources from fluid mineral extraction activities, including hydraulic fracturing (HF), could include the following scenarios:

- Contamination of aquifers during drilling through the introduction of drilling fluids.
- In the unlikely event that casing fails, extended fracture growth may allow fracking fluid migration into source water zones or drinking water supplies.
- Cross-contamination of aquifers from the introduction of drilling fluids into one aquifer that travels upward into shallower units due to improperly sealed well casings.
- In the unlikely event that casing strings fail, progressive contamination of deep confined, shallow confined, and unconfined aquifers may be possible.
- Contamination of shallow aquifers and surface water by improperly managed or closed reserve pits.

However, the potential for these impacts would continue to be minimized based on existing rules regarding the protection of groundwater resources. In addition, potential impacts would be minimized based on prospective new rules regarding hydraulic fracturing that include the following key components:

- Provisions for ensuring the protection of groundwater supplies by requiring a validation of well integrity and strong cement barriers between the wellbore and water zones through which the wellbore passes.
- Increased transparency by requiring companies to publicly disclose chemicals used in hydraulic fracturing to the BLM through the website FracFocus, within 30 days of completing fracturing operations.
- The use of tanks with few exceptions and the disclosure of handling and disposal methods of recovered waste fluids from hydraulic fracturing would mitigate risks to air, water, and wildlife.
- Measures to lower the risk of cross-well contamination with chemicals and fluids used in the fracturing operation, by requiring companies to submit more detailed information on the geology, depth, and location of preexisting wells to afford the BLM an opportunity to better evaluate and manage unique site characteristics.

The U.S. District Court for the District of Wyoming postponed the effective date of the BLM's Hydraulic Fracturing (HF) regulation. Therefore, the rule is not in effect, and the BLM may not implement or enforce it until further notice.

Fracture propagation associated with HF within the Planning Area is unlikely to directly affect freshwater aquifers because fracturing typically takes place at a depth of about 7,000 to 9,000 feet, while drinking water aquifers are typically less than 1,000 feet deep.

Impacts from Alternative A (No Action)

Under Alternative A, both oil and gas leasing and potash leasing could occur concurrently on the same tract of land, which could result in higher concentrations of development and redundant infrastructure. Although drilling for oil and gas and potash is similar, the production of potash requires the use of potash processing facilities, which involve large tracts of land over a long period of time. Any mineral (potash and oil and gas) activities that occur would result in surface-disturbing activities, which in turn could result in removal of vegetative cover, soil compaction, and increased erosion rates due to the exposure of soil particles to wind and water. There is a close correlation between the condition of soil and vegetation and water quality. Removal of vegetation and biological soil crust generally increases the rate at which water flows off the land. Substantial disturbance to soil, including compaction of soil or changes in vegetative cover that result in decreased surface coverage, root depth, or root density, would increase water runoff. Soil disturbance would also alter timing and duration of runoff, reduce infiltration capacity, and accelerate erosion, sedimentation, and the addition of nutrients and sediment loads to stream channels, thereby degrading water quality, channel structure, and overall watershed health. As the amount of surface disturbance increases, the ability of a watershed to buffer high flows, filter water and sediment, and provide habitat, such as stream cover, decreases. The degree of impact attributed to any one disturbance or series of disturbances is influenced by several factors, including location within the watershed, time and degree of disturbance, existing vegetation, and precipitation.

Linear disturbances, such as roads and pipelines, can have adverse impacts on soils, hydrologic functions, and hillslope/geomorphic processes. Impacts from this type of disturbance can include interception/diversion, concentration, and rerouting of surface and subsurface flows, reduced infiltration and increased runoff. The combination of concentrated flows, exposure of erosive soils in the road prism (road surface, and cut/fill surfaces), surface rutting, and stream crossings can lead to gully formation and increases in erosion and stream sedimentation. The type and extent of impact is dependent on soil properties and conditions, landscape location (e.g., ridge-top or midslope), and road parameters, such as construction design (inslope, outslope, drainage features), road surface condition, road gradient/grade length, and use levels/seasons.

Potash processing facilities would be allowed throughout the portion of the Planning Area not managed with an NSO stipulation or as closed to mineral leasing. In areas where potash processing facilities are constructed, localized water resources would be impacted in the short term during construction, due to loss of vegetation, increased runoff and soil erosion. The magnitude of long-term soil erosion and sediment, salt, and excess nutrient loading to water bodies from processing activities would depend on the duration of activities, as well as the type of reclamation efforts implemented and how long it would take for any disturbed areas to become stabilized and vegetated.

In Alternative A, approximately 210,884 acres would be managed as open to oil and gas and potash leasing, subject to standard terms and conditions. Oil and gas leasing and development would involve land-clearing and surface disturbances, such as the construction of well pads, roads, and pipelines in these areas. These actions remove and disturb vegetation, expose soils to the erosive forces of water and wind, and can alter and accelerate overland flow, resulting in increased transport of sediment, salt, and excess nutrients to water bodies both in the short-term, during construction activities, and long-term, as permanent structures, such as well pads, pits, and roads are maintained. Potash development would also involve land-clearing, road development, construction of processing facilities, and surface disturbances in both the short-term and long-term, which would remove and disturb vegetation and could result in short-term and long-term soil erosion,

stream sedimentation, salt and excess nutrient loading, groundwater contamination, and augmented water flows. The magnitude of long-term soil erosion, sedimentation, and augmented water flows from these activities would depend on the duration of activity, as well as the type of reclamation efforts implemented and how long it would take for disturbed areas to become stabilized and vegetated. The amount of stream sedimentation would depend on proximity of the operation to a stream.

Approximately 440,386 acres would be managed as open to mineral leasing (oil and gas and potash) subject to CSU and TL stipulations in Alternative A. CSU and TL stipulations would minimize the amount of surface disturbance and resulting vegetation loss, soil compaction and erosion, overland flow, and sediment, salt, and excess nutrient loading to water bodies.

Applying a NSO stipulation for mineral leasing (oil and gas and potash) to 133,574 acres in Alternative A would preclude surface-disturbing activity associated with mineral development and subsequent loss of vegetation, increased erosion and runoff to local water bodies in these areas. Applying an NSO stipulation along the Colorado, Green and Dolores River Corridors would protect these waters. In addition, applying the NSO stipulation within public water reserves, 100-year floodplains, and within 330 feet of riparian areas, springs, and other water resources (50,495 acres) would help protect both surface and groundwater resources, as the NSO stipulations would prevent vegetation loss, soil erosion, and increased runoff and transport of salts and sediments to nearby surface water bodies, and also protect groundwater quality and flow conditions, recharge areas and spring flows and water quality.

Closing areas to mineral leasing (753 acres) in Alternative A would prevent surface disturbance and maintain the health and function of water resources and water quality in these areas.

Developing and incorporating BMPs in Alternative A for activities in saline and other sensitive soils, along with site-specific mitigation measures, could reduce impacts to water resources, by stabilizing soils, decreasing erosion, and reducing salt and sediment runoff.

Modifying BMPs in Alternative A to meet water quality standards and maintain watershed function in Indian Creek could help to maintain water quality and function of this watershed over the long-term.

Applying a TL stipulation in Alternative A for mineral leasing prohibiting surface-disturbing activities on 68,275 acres of moderately to highly saline soils from December 1 to May 31 could provide additional protections to Colorado River system's water resources by minimizing soil runoff and erosion. In addition, this stipulation could help to maintain water resource quality by limiting potential salt and selenium loading to surface water, including the Colorado River, an impaired waterbody.

Mineral development utilizes water, although the water needs of oil and gas are far less than potash development. Within the Planning Area, a typical well drilled to the primary target formation would involve about 294,000 gallons of water. The water is used as a drilling medium, for mixing cement, and for various cleanup operations. Therefore, for the oil and gas wells projected in Alternative A, a total of about 68.2 million gallons of water could be utilized over the life of the plan. The source of this water is primarily municipalities and private sources. Water obtained from aquifers and surface water could result in the drawing down of the water table and reduction of available water resources for wildlife, vegetation, springs, streams, or public consumption. Withdrawal could affect local groundwater flow pattern and create changes in quality and quantity of the remaining groundwater. However, detailed impacts of this water use cannot be addressed until site specific operations identify the water source.

Potash development, including processing facilities, would require water as part of the production process. Water consumption associated with solar evaporation processing operations is estimated at 5,000 gallons per ton of potash production for a total of about 2 billion gallons per year. Water consumption associated

with crystallization processing operations is estimated at 1,300 per ton of potash production for a total of about 2.6 billion gallons per year. Under Alternative A, a total of 4.6 billion gallons of water per year could be utilized for potash development. The source of this water could come from one of four sources: 1) rivers and other surface water, 2) groundwater from usable aquifers, 3) saline water from the Paradox Member, or 4) offsite locations. However, detailed impacts of this water use cannot be addressed until site specific operations identify the water source. If the water is obtained from an existing water right granted on the Green or Colorado River systems, then the impact from the use has already been considered during allocation. Water obtained from local usable aquifers could result in the drawing down of the water table and reduction of available water resources for wildlife, vegetation, springs, streams, or public consumption. Withdrawal could affect local groundwater flow pattern and create changes in quality and quantity of the remaining groundwater. Saline water from the Paradox Member would affect neither usable groundwater nor surface water. The impacts from obtaining water from offsite sources cannot be addressed until the location of the sources are identified during review of site-specific proposals.

The entire Planning Area has been assessed to determine the relationship of the usable aquifers in the Planning Area (see Maps 3-43 to 3-47) to the mineral leasing decisions by alternative. Acreage figures are not additive because aquifers are overlapping between geologic features underground. Table 4-47 presents the mineral leasing decisions by alternative and for each aquifer (in acres).

Table 4-47. The Occurrence of Aquifers by Alternative and Mineral Leasing Decision (in acres)

Aquifers	Alternative A	Alternative B	Alternative C	Alternative D
Open to Leasing with Standard Terms and Conditions				
Dakota	20,363	0	0	0
Entrada	111,823	0	0	0
Glen Canyon	199,680	0	0	0
Cutler	210,728	0	0	0
Controlled Surface Use and Timing Limitations				
Dakota	76,736	70,565	22,037	71,571
Entrada	183,950	182,342	37,361	185,883
Glen Canyon	339,531	284,190	54,748	286,461
Cutler	436,419	285,805	54,799	288,073
No Surface Occupancy				
Dakota	3,223	28,928	70,642	21,108
Entrada	38,626	151,443	241,777	95,830
Glen Canyon	100,728	353,184	483,555	278,738
Cutler	130,338	487,882	549,854	350,922
Closed to Leasable Minerals				
Dakota	0	0	6,815	6,815
Entrada	0	0	54,349	52,073
Glen Canyon	0	0	99,070	72,175

Aquifers	Alternative A	Alternative B	Alternative C	Alternative D
Cutler	0	0	169,060	134,718

Under Alternative A, potash processing facilities could be located on any acreage managed with CSU/TL stipulations or open with standard terms and conditions (651,240 acres). Four aquifers (Dakota, Entrada, Glen Canyon, and Cutler in descending order) with usable water are located within the Planning Area. In the northern portion of the Planning Area, the underlying aquifers are overlain by an impermeable layer of shale and siltstone, the Tidwell-Summerville confining unit. This unit would prevent infiltration of contaminants produced by potash processing from reaching the underlying aquifers. In the southern portion of the Planning Area, the Entrada aquifer occurs near the surface and is not protected by a confining unit; the deeper Glen Canyon aquifer would also not benefit from an overlying confining unit. The unlikely release of contaminants resulting from potash processing facilities could compromise the water quality of the Entrada and Glen Canyon aquifers in the south.

Those aquifers identified with usable drinking water where the surface is managed as closed or with an NSO stipulation are protected from surface activities that could impact the underlying aquifers. Where the surface is managed as open with standard terms and conditions or with a CSU/TL stipulations, drilling operations would penetrate these aquifers in order to reach the targeted minerals (which are at depths below the aquifers in the Paradox Member). Casing and cementing regulatory requirements would prevent water migration and contamination of these aquifers.

Solution mining of potash entails injecting water through the cased bore hole into underground potash layers within the Paradox Member to dissolve the mineral into a brine, which is then pumped to the surface and is transported to processing facilities. Therefore, this extraction procedure would not result in impacts to underground aquifers.

Mineral operations for oil and gas and potash can result in inadvertent and unplanned leaks or spills. Spills from drilling and production, pipelines, and potash production (including brines and petroleum) have the potential to significantly impact surface and groundwater resources, especially when in close proximity to a waterbody, including ephemeral and intermittent streams and wetlands, or over unconfined aquifers. Spills resulting in contamination of surface and groundwater could also adversely impact other associated resources such as wildlife and vegetation. In general, when more land is available for mineral leasing, there is a greater projected level of mineral development. Higher levels of mineral development could result in a higher likelihood of a leak or spill.

Alternative A has the greatest amount of projected oil and gas and potash development (see Table 4-16 and Table 4-17) and also allows potash and oil and gas development to occur on the same tracts of land and at the same time. Therefore, Alternative A has the highest likelihood of leaks and spills. For all mineral operations, and in all alternatives, BMPs have been developed to protect both surface and groundwater. See Appendix B for BMPs developed for surface and groundwater resources.

Impacts from Alternative B

Under Alternative B, maximizing the size of oil and gas lease parcels could indirectly minimize impacts to water resources. The likelihood of redundant infrastructure would be reduced, which could in turn reduce the amount of surface disturbance associated with construction of this infrastructure (e.g., pipelines, well pads, and roads).

Applying the Baseline CSU stipulation to 208,185 acres in Alternative B1 and 222,289 acres in Alternative B2 could minimize impacts to water resources in these areas by limiting the amount of surface-

disturbing activities associated with mineral leasing and development, thereby maintaining vegetation, stabilizing soil, and limiting excess overland flow and sediment and salt transport to water bodies. In addition, applying the Baseline CSU stipulation to the Courthouse Wash Watershed (51,790 acres) to limit the amount of drilling within this groundwater recharge area and limiting the amount of drilling within the Salt Wash Watershed (61,925 acres) would help maintain both surface and groundwater quality by minimizing the potential for contamination by protecting the recharge areas. Applying the Baseline CSU stipulation in Alternative B would minimize impacts to water resources as compared to Alternative A. Applying an additional CSU stipulation to the Courthouse Wash and Salt Wash Watersheds requiring closed loop drilling, the use of tanks for produced and backflow water, well integrity, and other constraints would ensure the containment of fluids associated with oil and gas operations which would further protect surface and groundwater quality as compared to Alternative A.

Applying a CSU stipulation to important spring areas (38,056 acres) that includes a hydrologic assessment and water monitoring could help to maintain both surface water and groundwater resources by monitoring the quantity of water usage and recharge, and the potential for groundwater and surface water contamination. This CSU stipulation would minimize impacts to water resources as compared to Alternative A.

Applying the NSO stipulation to Drinking Water Source Protection Zones 1, 2, 3, and 4 (17,362 acres) could minimize the quantity and type of salts, excess nutrients, and other pollutants transported to these sources, and protect the pathways (both surface and below surface) to drinking water sources. Drinking Water Source Protection Zones are not addressed in Alternative A.

Under Alternative B, Porcupine Rim, which is adjacent to the Castle Valley Sole Source Aquifer (providing the drinking water for the town Castle Valley) would be managed with a NSO stipulation, affording greater indirect protection for this aquifer when compared to Alternative A which is managed with a CSU stipulation. The Glen Canyon Sole Source Aquifer is located outside the Planning Area to east. This aquifer is protected by the closed acreage in the Behind the Rocks Wilderness Study Area (WSA) (also outside the Planning Area) as well as NSO stipulations on a portion of the Planning Area lands to south of the WSA. This affords greater indirect protection for the Glen Canyon Aquifer when compared to the adjacent lands within the Planning Area in Alternative A, which are managed with a CSU stipulation.

Applying an NSO stipulation along the Colorado, Green, and Dolores River Corridors would protect these waters. In addition, applying the NSO stipulation to preclude mineral activities within public water reserves, 100-year floodplains and within 500 feet of intermittent and perennial streams, rivers, riparian areas, wetlands, water wells, lakes, and springs (69,786 acres) would provide for increased protections to water resources, compared to Alternative A, as the NSO stipulation area would be larger, encompassing 38 percent more acreage. Application of the NSO stipulation to preclude mineral activities within 100 feet of ephemeral drainages (58,545 acres) would provide protections to water resources as the NSO stipulation would prevent vegetation loss, soil erosion and compaction, and increased runoff and transport of salts and sediments to nearby ephemeral drainages. Minimizing the disturbance and removal of soils and vegetation near ephemeral drainages would also maintain the proper function and stability of stream banks, water quality, channel structure, and overall watershed health where disturbances are near, or hydrologically connected to, water bodies, and minimize the magnitude of downstream flooding and sediment loading during high precipitation events, as a proper functioning ephemeral stream would slow down the velocity and/or allow for infiltration of the runoff.

Applying the NSO stipulation to preclude surface mineral activities within 750 feet of the Colorado River and Fisher Creek (4,590 acres) would minimize impacts to these impaired water resources by maintaining the stream bank integrity, and preventing vegetation loss, soil erosion, runoff and transport of excess salts, sediments, and other dissolved solids to the Colorado River and Fisher Creek. In addition, NSO stipulations

applied to other resources extend the protection for these impaired water bodies. These impaired water bodies were not specifically addressed in Alternative A; in addition, the extent of the NSO stipulations surrounding the impaired waterbodies is much less in Alternative A.

Applying BMPs to minimize potential runoff, soil erosion, and salt and sediment loading to water resources from mineral development would minimize impacts to water resources, and reduce impacts from surface-disturbing activities where soil-stabilizing vegetation is removed or damaged. Application of BMPs for water resources to mineral drilling operations for the protection of surface and groundwater resources, for the protection of shallow aquifers and potential unconsolidated aquifers would maintain and could improve both surface and groundwater resources in the Planning Area. BMPs for water resources were not specifically addressed in Alternative A.

Under Alternative B, the surface over the four aquifers with usable water resources is managed more restrictively than under Alternative A. In contrast to Alternative A, zero acres are managed as open to leasing subject to standard terms and conditions. Alternative B provides a 274 percent increase in lands managed with an NSO stipulation and closed to mineral leasing over the four aquifers as compared to Alternative A. As a result, much more acreage above the four usable aquifers would not be impacted by mineral development (see acreages in Table 4-47), groundwater quality, flow conditions, recharge areas, and spring flows.

In Alternative B, for those areas managed with CSU and TL stipulations, the impacts to the four aquifers with usable water resources from drilling operations would be similar to those described under Alternative A; however there is much less CSU/TL acreage in Alternative B as compared to Alternative A (see Table 4-47). Where the surface is managed as open with CSU/TL stipulations, drilling operations would penetrate these aquifers in order to reach the targeted minerals (which are at depths below the aquifers in the Paradox Member). Casing and cementing regulatory requirements would prevent water migration and contamination of these aquifers.

Impacts Specific to Alternative B1 Only

Not issuing new oil and gas leases within PLAs (103,619 acres) could help to minimize adverse impacts to water resources by limiting the amount of surface disturbance within the PLAs. These adverse impacts could result from the concurrent oil and gas development and potash development, which could occur under Alternative A. However, 43 percent of the Hatch Point PLA contains existing oil and gas leases. Therefore, there is potential for concurrent development of oil and gas and potash on these existing leases and a greater likelihood for adverse impacts to water resources over the next 15 years in the Hatch Point PLA. Furthermore, if potash resources do not develop in that time frame, the area could again be available for oil and gas leasing. If the acreage encompassed by PLAs were to become available solely for oil and gas leasing and development, the adverse impacts to water resources would be similar to or less than the impacts identified for potash leasing and development. Alternative B1 does not allow potash leasing on 681,948 acres within the Planning Area, which would minimize adverse impacts to water resources from concurrent oil and gas and potash development as compared to Alternative A.

PLAs would be identified in the Upper Ten Mile area (29,127 acres), the Red Wash area where potash prospecting permits have been issued (29,956 acres), and the Hatch Point area where potash prospecting permits have been issued (44,536 acres). The PLAs would total 103,619 acres. Designating these PLAs could impact water resources within these areas. In these PLAs, surface-disturbing activities associated with potash leasing and development could occur and result in loss of vegetation, destabilization of soils, increased erosion, and greater sediment and salt runoff. A phased approach to potash leasing could help reduce impacts to water resources as compared to Alternative A. By testing the feasibility of potash development, unnecessary surface disturbance would be avoided and appropriate mitigation measures applied. These measures would benefit water resources.

Applying the CSU stipulation to all potash leases in Alternative B1 that requires processing facilities to be located within a PPFA (42,492 acres) would result in impacts to surface water resources similar to those described in Alternative A. However, more facilities are expected in Alternative A, which would disturb 1,179 more acres of soil and vegetation than that expected in Alternative B1 resulting in decreased impacts to surface water resources under Alternative B1. The 42,492 acres of proposed PPFA overlay the four aquifers with usable water sources (Dakota, Entrada, Glen Canyon, and Cutler). In the northern portion of the Planning Area, the aquifers underlying the proposed PPFAs are overlain by an impermeable layer of shale and siltstone, the Tidwell-Summerville confining unit. This unit would prevent infiltration of contaminants produced by potash processing from reaching the underlying aquifers. In the southern portion of the Planning Area, the Entrada aquifer occurs near the surface and is not protected by a confining unit; the deeper Glen Canyon aquifer would also not benefit from an overlying confining unit. The unlikely release of contaminants resulting from potash processing facilities could compromise the water quality of the Entrada and Glen Canyon aquifers in the south.

Under Alternative B1, there are zero acres managed as open to mineral leasing (oil and gas and potash) subject to standard terms and conditions. This would reduce the amount of mineral development and the impacts to water resources throughout the Planning Area as compared to Alternative A.

CSU and TL stipulations for oil and gas leasing would be applied to 228,926 acres in Alternative B1. While Alternative B1 has 221,430 fewer acres than Alternative A that are managed with CSU and TL stipulations, all of these acres are managed more restrictively (NSO and closed) in Alternative B1. Thus, Alternative B1 provides more protection to water resources than does Alternative A.

An NSO stipulation for oil and gas leasing would be applied to 452,269 acres in Alternative B1. This is 318,695 acres more than Alternative A that are managed with an NSO stipulation. Therefore, Alternative B1 provides greater protection to water resources than that provided in Alternative A. The acreage closed in Alternative B1 (753 acres) is identical to that in Alternative A and therefore, the impacts to water resources are the same.

Within PLAs (103,619 acres), CSU and TL stipulations for potash leasing in Alternative B1 would be applied to 57,620 acres, while 45,999 acres would be subject to NSO stipulations. Therefore, surface disturbance to water resources from potash well drilling would be restricted to 57,620 acres, which is 593,620 fewer acres than are available for potash well drilling in Alternative A. Projected potash well drilling in Alternative A amounts to 1,223 acres of surface disturbance and the projected potash well drilling in Alternative B1 amounts to 647 acres of surface disturbance. Therefore, the potential impacts to water resources are less in Alternative B1 than Alternative A.

Applying a TL stipulation for mineral leasing prohibiting surface-disturbing activities on moderately to highly saline soils from December 1 to May 31 would have similar impacts to water resources discussed in Alternative A, but to a lesser extent as this stipulation would not apply to PPFAs (42,492 acres). However, applying a CSU stipulation within PPFAs requiring compensatory mitigation outside the area of impact for any surface disturbance on saline soils (18,360 acres) could help to maintain water resource quality by limiting potential salt and selenium loading to surface water, including the Colorado River, an impaired water body.

Under Alternative B1, it is estimated that up to 44.7 million gallons of water per year could be utilized for projected oil and gas development, which is about 23.5 million gallons less than Alternative A. Water consumption for potash development is estimated at 2.8 billion gallons of water per year for Alternative B1, which is 1.8 billion gallons less than Alternative A. The reduction of water use in Alternative B1 as compared to Alternative A would result in less impacts to available water resources for wildlife, vegetation, springs, streams, or public consumption.

Mineral operations for oil and gas and potash can result in inadvertent and unplanned leaks or spills. Spills from drilling and production, pipelines and potash production (including brines and petroleum) have the potential to significantly impact surface and groundwater resources, especially when in close proximity to a waterbody, including ephemeral and intermittent streams and wetlands, or over unconfined aquifers. In general, when more land is available for mineral leasing, there is a greater projected level of mineral development. Higher levels of mineral development could result in a higher likelihood of a leak or spill.

Alternative B1 would result in less projected oil and gas and potash development than in Alternative A (see Table 4-16 and Table 4-17). In addition, Alternative B1 does not allow potash and oil and gas development to occur on the same tracts of land and at the same time. Therefore, Alternative B1 has less likelihood of leaks and spills than under Alternative A.

Impacts Specific to Alternative B2 Only

In Alternative B2, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would reduce impacts to water resources that would result from the concurrent development of oil and gas and potash as described in Alternative A. The impacts to water resources from the potash development provided in Alternative B1 would be greater than the exclusion of potash development in Alterative B2.

Alternative B2 would substitute oil and gas well drilling for potash well drilling within the PLAs established in Alternative B1 and the impacts to water resources would be similar. The major difference between Alternative B1 and Alternative B2 is that Alternative B2 eliminates the 3,037 acres of surface disturbance and the associated potential adverse impacts to water resources that could result from the construction of potash processing facilities within the 42,492 acres of PPFAs established in Alternative B1.

Under Alternative B2, there are zero acres managed as open to oil and gas leasing subject to standard terms and conditions. This would reduce the amount of mineral development and the impacts to water resources throughout the Planning Area as compared to Alternative A. Impacts to water resources would be the same as those described in Alternative B1.

CSU and TL stipulations for oil and gas leasing would be applied to 285,806 acres in Alternative B2. While Alternative B2 has 154,550 fewer acres than Alternative A that are managed with CSU and TL stipulations, all of these acres are managed more restrictively (NSO and closed) in Alternative B2. Thus, Alternative B2 provides more protection to water resources than does Alternative A and provides a similar amount of protection to water resources as Alternative B1.

An NSO stipulation for oil and gas leasing would be applied to 499,008 acres in Alternative B2. This is 365,434 acres more than Alternative A, which are managed with an NSO stipulation. Therefore, Alternative B2 provides greater protection to water resources than that provided in Alternative A and provides a similar amount of protection to water resources as Alternative B1. The acreage closed in Alternative B2 (753 acres) is identical to that in Alternatives A and B1; therefore, the impacts to water resources are the same.

Applying a TL stipulation for mineral leasing prohibiting surface-disturbing activities on moderately to highly saline soils from December 1 to May 31 would have similar impacts to water resources discussed in Alternative A and could help to maintain water resource quality by limiting potential salt and selenium loading to surface water, including the Colorado River, an impaired water body.

Under Alternative B2, it is estimated that up to 55.3 million gallons of water per year could be utilized for projected oil and gas development which is about 16.9 million gallons less than Alternative A and 10.6

million gallons more than Alternative B1. However, under Alternative B2, no water would be utilized for potash development compared to the 4.6 billion gallons per year utilized in Alternative A and the 2.8 billion gallons per year utilized in Alternative B1. Therefore, Alternative B2 utilizes less water than do Alternatives A and B1, resulting in less impacts to available water resources for wildlife, vegetation, springs, streams, or public consumption.

Mineral operations for oil and gas and potash can result in inadvertent and unplanned leaks or spills. Spills from drilling and production, pipelines and potash production (including brines and petroleum) have the potential to significantly impact surface and groundwater resources, especially when in close proximity to a waterbody, including ephemeral and intermittent streams and wetlands, or over unconfined aquifers. In general, when more land is available for mineral leasing, there is a greater projected level of mineral development. Higher levels of mineral development could result in a higher likelihood of a leak or spill.

Alternative B2 would result in no potash development and less projected oil and gas development than in Alternative A (see Table 4-16 and Table 4-17). The amount of oil and gas development is slightly higher than projected in Alternative B1. Therefore, Alternative B2 has less likelihood of leaks and spills than under Alternatives A and B1.

Impacts from Alternative C

In Alternative C, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would result in the same impacts to water resources as those described in Alternative B2.

Applying the Baseline CSU stipulation (25,942 acres) for oil and gas leasing and development in Alternative C, could reduce surface disturbance and associated impacts to water when compared to Alternative A. Impacts to water resources would be similar to Alternatives B1 and B2.

Maximizing the size of oil and gas leases in Alternative C would minimize impacts to water resources as discussed in Alternative B. Maximizing lease size is not addressed in Alternative A.

Under Alternative C, there are zero acres managed as open to oil and gas leasing subject to standard terms and conditions. This would reduce the amount of mineral development and the impacts to water resources throughout the Planning Area as compared to Alternative A. Impacts to water resources would be the same as those described in Alternatives B1 and B2.

Alternative C applies CSU and TL stipulations to oil and gas leasing on 54,799 acres, which is much less acreage than Alternatives A and B. While Alternative C has fewer acres that are managed with a CSU or TL stipulation, these acres are managed more restrictively (NSO and closed). Thus, Alternative C provides more protection to water resources than do Alternatives A and B.

Applying an NSO stipulation in Alternative C to oil and gas leasing would prevent surface-disturbing activities from oil and gas development on 550,599 acres, which is 412,496 more acres as compared to Alternative A, and 51,511 acres more than Alternatives B1 and B2. Impacts to water resources would be similar to those described under Alternatives A, B1, and B2, but would apply to a much larger area in Alternative C.

Under Alternative C, closing 180,169 acres to oil and gas leasing and development would preclude surface disturbance on 179,416 more acres than Alternatives A, B1, and B2. Impacts to water resources would be similar to those described under alternative A, but would apply to far more acres of water resources.

In Alternative C, applying a TL stipulation for mineral leasing prohibiting surface-disturbing activities on 68,275 acres of moderately to highly saline soils from December 1 to May 31 would minimize impacts to water resources as discussed in Alternatives A and B2, and could help to maintain water resource quality by limiting potential salt and selenium loading to surface water, including the Colorado River, an impaired water body.

Applying the NSO stipulation to Drinking Water Source Protection Zones 1, 2, 3, and 4 (17,362 acres) in Alternative C would have the same impacts to water resources as those described in Alternative B.

Under Alternative C, Porcupine Rim, which is adjacent to the Castle Valley Sole Source Aquifer (providing the drinking water for the town Castle Valley), would be closed to mineral leasing and development thereby affording greater indirect protection for this aquifer when compared to Alternatives A and B. The Glen Canyon Sole Source Aquifer is located outside the Planning Area to east. This aquifer is protected by the closed acreage in the Behind the Rocks WSA (also outside the Planning Area) as well as NSO stipulations on all Planning Area lands to south of the WSA. This affords greater indirect protection for the Glen Canyon Aquifer when compared to the adjacent lands within the Planning Area in Alternatives A and B.

Closing the Colorado, Green and Dolores River corridors to mineral leasing would protect these waters. In addition, applying the NSO stipulation in Alternative C to preclude mineral activities within public water reserves, 100-year floodplains, and within 660 feet of intermittent and perennial streams, rivers, riparian areas, wetlands, water wells, lakes, and springs (91,558 acres) would reduce the amount of surface disturbance and provide for increased protections to water resources. This NSO stipulation provides more protection to these water resources than that provided in Alternative A, which protects 50,495 acres, and that provided in Alternative B, which protects 69,786 acres.

Application of the NSO stipulation in Alternative C to preclude mineral activities within 200 feet of ephemeral drainages would provide increased protections to water resources (115,121 acres), compared to Alternative B (58,545 acres), which applies the NSO stipulation within 100 feet of ephemeral drainages. Alternative A does not address ephemeral drainages.

Applying an NSO stipulation in Alternative C to preclude mineral activities within 1,000 feet of the Colorado River and Fisher Creek (6,883 acres) would provide increased protections to impaired water resources compared to Alternative B (4,590 acres), which applies an NSO stipulation within 750 feet of impaired water resources. In addition, NSO stipulations applied to other resources extend the protection for these impaired water bodies. These impaired water bodies were not specifically addressed in Alternative A; in addition, the extent of the NSO stipulations surrounding the impaired waterbodies is greater in Alternative C than in any other alternative.

Developing BMPs for soils to minimize potential runoff, soil erosion, and salt and sediment loading to water resources from mineral development, improving soil stabilization, and maintaining water resources, would minimize impacts to water resources as discussed in Alternative B. Application of BMPs to drilling operations for the protection of surface and groundwater resources and for the protection of shallow aquifers and potential unconsolidated aquifers would maintain both surface and groundwater resources in the Planning Area and impacts to water resources would be the same as those described in Alternative B. BMPs for soils and surface and groundwater resources were not specified in Alternative A.

Applying an NSO stipulation to important spring areas (38,056 acres), the Courthouse Wash (51,790 acres) and Salt Wash Watersheds (61,925 acres) in Alternative C, would preclude surface disturbance associated with mineral development. The NSO stipulations would increase protections to these surface and groundwater resources, as compared to the CSU stipulation applied to them in Alternative B. Alternative A did not address these resources specifically.

Under Alternative C, the surface over the four aquifers with usable water resources is managed more restrictively than under Alternatives A or B. Similar to Alternative B, no acres are managed as open to leasing subject to standard terms and conditions. Alternative C provides a 513 percent increase in lands managed with an NSO stipulation and closed to mineral leasing over the four aquifers as compared to Alternative A and 63 percent increase over Alternative B. As a result, much more acreage above the four usable aquifers would not be impacted by mineral development in Alternative C as compared to Alternatives A and B (see acreages in Table 4-47), thereby protecting groundwater quality, flow conditions, recharge areas, and spring flows. In Alternative C, for those areas managed with CSU and TL stipulations, the impacts to underground water sources would be similar to those described under Alternative A.

Under Alternative C, it is estimated that up to 10.6 million gallons of water per year could be utilized for projected oil and gas development, which is about 57.6 million gallons less than Alternative A, 34.1 million gallons less than Alternative B1, and 44.7 million gallons less than Alternative B2. However, under Alternative C, no water would be utilized for potash development compared to the 4.6 billion gallons per year utilized in Alternative A and the 2.8 billion gallons per year utilized in Alternative B1. Therefore, Alternative C utilizes less water than do Alternatives A, B1, and B2, resulting in less impacts to available water resources for wildlife, vegetation, springs, streams, or public consumption.

Mineral operations for oil and gas and potash can result in inadvertent and unplanned leaks or spills. Spills from drilling and production, pipelines and potash production (including brines and petroleum) have the potential to significantly impact surface and groundwater resources, especially when in close proximity to a waterbody, including ephemeral and intermittent streams and wetlands, or over unconfined aquifers. In general, when more land is available for mineral leasing, there is a greater projected level of mineral development. Higher levels of mineral development could result in a higher likelihood of a leak or spill.

Alternative C would result in no potash development and less projected oil and gas development than in Alternatives A, B1, and B2 (see Table 4-16 and Table 4-17). Therefore, Alternative C has the least likelihood of leaks and spills than any other alternative.

Impacts from Alternative D

Maximizing the size of oil and gas lease parcels in Alternative D would minimize impacts to water resources as discussed in Alternatives B and C.

Implementing BMPs in Alternative D to minimize potential runoff, soil erosion, and salt and sediment loading to water resources from mineral development would minimize impacts to water resources as discussed in Alternatives B and C.

Applying the Baseline CSU stipulation in Alternative D for all mineral development on 213,218 acres, could reduce surface disturbance when compared to Alternative A. Impacts to water resources from the Baseline CSU stipulation would be the same as those described under Alternatives B and C. However, Alternative D provides an exception to the Baseline CSU stipulation that could result in additional development activity and associated impacts to water resources from surface disturbance. Therefore, the Baseline CSU stipulation in Alternative D provides less protection to water resources than does Alternatives B and C. Applying an additional CSU stipulation to the Courthouse Wash and Salt Wash Watersheds in Alternative D requiring closed loop drilling, well integrity, and other constraints would protect surface and groundwater quality in the same manner as described in Alternative B and less than Alternative C.

Impacts to water resources in Alternative D from limiting potash leasing to PLAs (103,619 acres) and implementing phased potash leasing are the same as those described in Alternative B1. Alternatives B2 and C do not provide for potash leasing and thus, would not result in adverse impacts to water resources

from potash development. Alternative D does not allow potash leasing on 681,948 acres within the Planning Area, which would minimize adverse impacts to water resources from concurrent oil and gas and potash development as compared to Alternative A.

Designating a PLA in the Upper Ten Mile area, the Red Wash area where potash prospecting permits have been issued, and the Hatch Point area where potash prospecting permits have been issued would have the same impacts to water resources as those discussed under Alternative B1.

Applying the CSU stipulation to all potash leases in Alternative D that requires processing facilities to be located within a PPFA (42,492 acres) would result in the same impacts to surface water resources as those described in Alternative B1. However, more facilities are expected in Alternative A, which would disturb 1,179 more acres of soil and vegetation than that expected in Alternatives D resulting in decreased impacts to water resources under Alternatives D as compared to Alternative A. Alternatives B2 and C preclude potash leasing and therefore, there would be no impact to water resources associated with potash development. Impacts to groundwater resources from proposed PPFAs would be the same as those described in Alternative B1.

Under Alternative D, as in Alternatives B1, B2, and C there are zero acres managed as open to oil and gas and potash leasing with standard terms and conditions as compared with the 210,884 acres in Alternative A. Therefore, Alternative D could result in fewer impacts to water resources as compared to Alternative A.

Applying CSU and TL stipulations in Alternative D to oil and gas leasing on 230,675 acres would result in similar impacts to water resources as those described in Alternative B. While Alternative D has 209,781 fewer acres than Alternative A that are managed with a CSU or TL stipulation, all of these acres are managed more restrictively (NSO and closed) in Alternative D. Thus, Alternative D provides more protection to water resources than does Alternative A. While Alternative D has 175,966 more acres than Alternative C that are managed with a CSU or TL stipulation, the majority of these acres are managed more restrictively in Alternative C. Thus, Alternative C provides more protection to water resources than does Alternative D.

Applying an NSO stipulation in Alternative D to oil and gas leasing would prevent surface-disturbing activities from oil and gas development on 305,899 acres, which is 172,325 more acres as compared to Alternative A, but 245,700 acres fewer than Alternative C. While Alternatives B1 and B2 manage 146,390 more acres with an NSO stipulation as opposed to Alternative D, the majority of these 146,390 acres are managed as closed in Alternative D. Thus, Alternative D provides more protection to water resources than do Alternatives A, B1, and B2, but less protection than Alternative C. Water resources include the Colorado, Dolores and Green Rivers, public water reserves, the 100 year floodplain, intermittent, perennial and ephemeral streams, wetlands, springs, riparian areas, water wells and impaired water bodies (Colorado River and Fisher Creek).

Alternative D provides an exception to the NSO for visual resources that could result in some additional mineral development and impacts to water resources from surface-disturbing activities within VRM Class II areas. This exception could result in more impacts to water resources from surface-disturbing activities than would be allowed in Alternative B1.

CSU and TL stipulations for potash leasing would be applied in Alternative D to 57,308 acres and would result in the same impacts to water resources as those described in Alternative B1. Applying a CSU stipulation to all potash leases that requires processing facilities to be located within a PPFA (42,492 acres) would have the same impacts to water resources as discussed in Alternative B1, apart from any area that would be granted an exception in the future. An exception to the PPFA stipulation could be granted for small-scale potash processing facilities located within the PLAs; if these small-scale potash processing

facilities were constructed, impacts to water resources would be greater than Alternative B1, due to greater surface disturbance (up to 100 acres). In Alternatives B2 and C, the Planning Area is closed to potash leasing and development resulting in greater protection to water resources.

Applying an NSO stipulation to potash leasing on 45,999 acres would result in the same impacts to water resources as those described in Alternative B1. Potash leasing and development is precluded in Alternatives B2 and C; therefore, impacts to water resources from potash development are greater in Alternative D as compared to Alternatives B2 and C.

Applying a TL stipulation for mineral leasing in Alternative D prohibiting surface-disturbing activities on moderately to highly saline soils from December 1 to May 31 and applying a CSU stipulation within PPFAs requiring compensatory mitigation outside the area of impact for any surface disturbance on saline soils would provide the same protections to water resources as discussed in Alternative B1. These protections could help to maintain water resource quality by limiting potential salt and selenium loading to surface water, including the Colorado River, an impaired water body. In addition, applying a CSU stipulation that requires compensatory mitigation outside the area of impact for any surface disturbance on saline soils (68,348 acres), and applying BMPs for soils, would provide the same protections to water resources as discussed in Alternative B. Compared to Alternative A, applying a CSU stipulation for activities on slopes greater than 21 percent throughout the Planning Area would result in increased protections to water resources, as the slope threshold would be less (21 percent compared to 30 percent for Moab and 21 percent – 40 percent for Monticello) and the CSU stipulation would cover the entire Planning Area (181,110 acres).

Applying the NSO stipulation to Drinking Water Source Protection Zones 1, 2, 3, and 4 (17,362 acres) in Alternative D would have the same impacts to water resources as those described in Alternatives B and C.

Under Alternative D, Porcupine Rim, which is adjacent to the Castle Valley Sole Source Aquifer (providing the drinking water for the town Castle Valley), would be closed to mineral leasing and development. This management would thereby afford greater indirect protection for this aquifer when compared to Alternatives A and B, and the same protection afforded in Alternative C. The protections afforded to the adjacent lands of the Glen Canyon Aquifer are the same as described in Alternative B.

Developing BMPs to minimize potential runoff, soil erosion, and salt and sediment loading to water resources from mineral development, and applying BMPs for water resources, to drilling operations, and for the protection of shallow aquifers and potential unconsolidated aquifers would minimize impacts to water resources in the same manner as discussed in Alternative B.

Under Alternative D, the surface over the four aquifers with usable water resources is managed more restrictively than under Alternatives A or B, but not as restrictively as C. Similar to Alternatives B and C, no acres are managed as open to leasing subject to standard terms and conditions. Alternative D provides a 247 percent increase in lands managed with an NSO stipulation and closed to mineral leasing over the four aquifers as compared to Alternative A, a 7 percent decrease compared to Alternative B, and a 43 percent decrease compared to Alternative C. NSO and closed acreage above the four usable aquifers in Alternative D would not be impacted by mineral development (see acreages in Table 4-47), thereby protecting groundwater quality, flow conditions, recharge areas, and spring flows.

In Alternative D, for those areas managed with CSU and TL stipulations, the impacts to the four aquifers with usable water resources from drilling operations would be similar to those described under Alternative A; however there is much less CSU/TL acreage in Alternative D as compared to Alternative A (see Table 4-47). Where the surface is managed as open with CSU/TL stipulations, drilling operations would penetrate these aquifers in order to reach the targeted minerals (which are at depths below the aquifers in the Paradox

Member). Casing and cementing regulatory requirements would prevent water migration and contamination of these aquifers.

Under Alternative D, it is estimated that up to 49.4 million gallons of water per year could be utilized for projected oil and gas development, which is about 18.8 million gallons less than Alternative A, 4.7 million gallons more than Alternative B1, 5.9 million gallons less than Alternative B2, and 38.8 million gallons less than Alternative C. Water consumption for potash development is estimated at 2.8 billion gallons of water per year for Alternatives B1 and D, which is 1.8 billion gallons less than Alternative A, and 2.8 billion gallons more than under Alternatives B2 and C. The reduction of water use in Alternative D as compared to Alternative A would result in less impacts to available water resources for wildlife, vegetation, springs, streams, or public consumption. However, Alternative D utilizes more water than do Alternatives B2 and C, resulting in more impacts to available water resources. Alternative D utilizes approximately the same amount of water as in Alternative B1, resulting in similar impacts to available water resources.

Mineral operations for oil and gas and potash can result in inadvertent and unplanned leaks or spills. Spills from drilling and production, pipelines and potash production (including brines and petroleum) have the potential to significantly impact surface and groundwater resources, especially when in close proximity to a waterbody, including ephemeral and intermittent streams and wetlands, or over unconfined aquifers. In general, when more land is available for mineral leasing, there is a greater projected level of mineral development. Higher levels of mineral development could result in a higher likelihood of a leak or spill.

Alternative D would result in less projected potash development than in Alternative A and the same amount of potash development as in Alternative B1. Alternative D would result in more projected potash development than Alternatives B2 and C, which allow for no potash development (see Table 4-17). Alternative D would result in less projected oil and gas development than in Alternatives A and B2, more than Alternative C and approximately the same as Alternative B1 (see Table 4-16). Therefore, Alternative D has less likelihood of leaks and spills than under Alternative A, similar likelihood as Alternative B1, and more likelihood than Alternatives B2 and C.

4.14 SPECIAL DESIGNATIONS: AREAS OF CRITICAL ENVIRONMENTAL CONCERN

This section presents potential impacts to Areas of Critical Environmental Concern (ACEC) from implementing management actions presented in Chapter 2. Existing conditions concerning ACECs are described in Chapter 3.

4.14.1 Assumptions

The analysis of effects on ACECs from the implementation of management actions is limited to the protection of and prevention of damage to the relevant and important values.

4.14.2 Impacts Common to All Alternatives

There would be no impacts to ACECs that are common to all alternatives.

4.14.3 Impacts from Alternative A (No Action)

Applying an NSO stipulation to mineral leasing on all ACECs (26,187 acres) could prevent surface disturbance from mineral development, which would protect scenic vistas, prevent erosion and runoff from development activities, and support the relevant and important values of the ACECs. Therefore, an NSO stipulation could protect the relevant and important values of the ACEC acreage itself. However, scenic impacts to the ACEC could occur when horizontal drilling takes place to access the underlying Federal mineral resources from outside the ACEC. Those ACECs that are managed to protect the relevant and important value of scenery are Behind the Rocks, Highway 279/Shafer Basin/Long Canyon, Indian Creek, and Shay Canyon ACECs.

Table 4-48 shows the acreage of mineral leasing categories for the combined acreage of ACECs by alternative. All ACECs are protected, at a minimum, with an NSO stipulation.

Table 4-48. Mineral Leasing Categories by Combined Areas of Critical Environmental Concern Acreage

Leasing Categories	Alternative A	Alternative B1	Alternative B2	Alternative C	Alternative D
Oil and Gas					
Open	0	0	0	0	0
CSU	0	0	0	0	0
NSO	26,187	22,936	26,187	0	9,561
Closed	0	0	0	26,187	13,375
Deferred (PLA)	0	3,251	0	0	3,251
Potash					
Open	0	0	0	0	0
CSU	0	0	0	0	0
NSO	26,187	3,251	0	0	3,251
Closed	0	0	0	26,187	13,375

Leasing Categories	Alternative A	Alternative B1	Alternative B2	Alternative C	Alternative D
Deferred (outside PLA)	NA	22,936	26,187	0	9,651

4.14.4 Impacts from Alternative B

Impacts Specific to Alternative B1 Only

Applying an NSO stipulation to oil and gas leasing on 22,936 acres of ACECs, as well as applying an NSO stipulation to 3,251 acres of potash leasing would have the same impact as those described under Alternative A.

Impacts Specific to Alternative B2 Only

Applying an NSO stipulation to oil and gas leasing on 26,187 acres of ACECs and closing the entire Planning Area to potash leasing would have the same impact as those described under Alternative A.

4.14.5 Impacts from Alternative C

Closing 26,187 acres of ACECs to oil and gas and potash leasing would have a similar impact as under Alternatives A and B, except for those where mineral closures would add further protection for scenic ACECs. Closing these ACECs to mineral leasing would preclude drilling from adjacent lands to access the underlying Federal mineral resources. This would minimize potential impacts that could occur to the viewshed from the ACECs. Those ACECs with relevant and important scenic values include Behind the Rocks, Highway 279/Shafer Basin/Long Canyon, Indian Creek, and Shay Canyon ACECs.

4.14.6 Impacts from Alternative D

Applying an NSO stipulation to oil and gas leasing on 9,561 acres of ACECs, closing 13,375 acres of ACECs to oil and gas leasing, and applying an NSO stipulation on 3,251 acres of potash leasing would have a similar impact as under Alternatives A and B, except for those where mineral closures would add further protection for scenic ACECs. Closing these ACECs to mineral leasing would preclude drilling from adjacent lands to access the underlying Federal mineral resources. This would minimize potential impacts that could occur to the viewshed from the ACECs. Those scenic ACECs, to be managed as closed under Alternative D, are a portion of the Highway 279/Shafer Basin/Long Canyon ACEC and the Indian Creek ACEC in its entirety. There would be 12,812 fewer acres of ACEC closed to mineral leasing in Alternative D as compared with Alternative C.

4.15 SPECIAL DESIGNATIONS: NATIONAL HISTORIC TRAILS AND BACKWAYS AND BYWAYS

4.15.1 National Historic Trail – Old Spanish National Historic Trail

Assumptions

- In all alternatives, the Old Spanish National Historic Trail (OSNHT) would be managed to safeguard the nature and purposes of the trail. This would minimize adverse impacts to the resources, qualities, values, and associated settings, and the primary use or uses of the trail.

- In all alternatives, proposed management would not substantially interfere with or be incompatible with the nature and purposes of the OSNHT.

Impacts Common to All Alternatives

Applying an NSO stipulation along the U.S. Highway 191 utility corridor would reduce the level of surface disturbance, reduce possible changes to scenic elements of the landscape, and preserve scenic and historic settings along the OSNHT where it follows the highway.

Impacts from Alternative A (No Action)

Identifying and classifying segments of the OSNHT would help to preserve its historic integrity. OSNHT classification and planning could protect trail segments from future mineral development impacts, but more specific impacts would not be available until OSNHT plan completion.

Impacts from mineral development that are open to leasing with standards stipulation or with minor constraints (CSU and TL stipulations) could reduce the natural and historic settings along the OSNHT. Of the 28.8 miles of OSNHT on public lands within the Planning Area, about 21.2 miles are open or are managed with minor constraints (CSU and TL stipulations). Wells, pipelines, increased road traffic, noise, dust, and the visual impact of mineral facilities in otherwise natural areas could all reduce the quality of historic settings along the trail. Compared to oil and gas development, potash development, which would occur with the same leasing restrictions and in the same areas as oil and gas, could have more impacts to historic trail settings. In addition, well spacing and pipelines could be more concentrated and processing facilities would be larger and more industrial. The use of BMPs could reduce some of these impacts. Areas where an NSO stipulation overlaps the trail (7.6 miles), as well as adjacent areas, would eliminate surface disturbance and thereby impacts to the historic settings of the trail.

Impacts from Alternative B

Applying a CSU stipulation along the OSNHT could help to protect the scenic, natural, and historic significance of the trail in these areas. The CSU stipulation would require a visual assessment to protect the integrity of viewsheds along a 2 mile width on both sides of the OSNHT where the where the resource condition is Category II (22,181 acres). This would provide more protection for the integrity of the viewsheds from the intact portions of the OSNHT as compared to Alternative A. The viewsheds in portions of the OSNHT that are not resource condition Category II could be adversely impacted by mineral development. The physical evidence of the trail trace itself would be protected through compliance with the National Historic Preservation Act.

Impacts from Alternative C

Applying an NSO stipulation along the congressionally designated OSNHT, would preserve the historic integrity and natural condition of the trail in its entirety, including the viewshed. When compared to Alternatives A and B, the area protected would be greater. The NSO would apply to a 2-mile width on both sides of the entire OSNHT (71,439 acres).

Impacts from Alternative D

Impacts to the OSNHT from mineral leasing and development would be less than those described for Alternative B because CSU stipulations are applied to high potential sites and segments and a Lease Notice is applied to the entire trail.

The CSU stipulation for the OSNHT would allow a corridor for the transportation of potash along the existing Class B roads in the Blue Hills high potential segment. Since these constructed and regularly maintained roads already form a visual intrusion on the trail setting, additional infrastructure would not add appreciably to the visual impacts.

4.15.2 National and State Scenic Backways and Byways

Assumptions

The National Scenic Byway along Highway 191 and State backways and byways would be managed to protect the aesthetic, cultural, historic, natural, and recreational qualities for which these roads were designated.

Impacts Common to All Alternatives

NSO along the U.S. Highway 191 utility corridor would prevent mineral development that could reduce the natural quality of viewsheds along the National Scenic Byway on Highway 191 north of Moab. NSO would protect the viewshed, scenic touring opportunities, and heritage values of the byway.

Impacts from Alternative A (No Action)

Applying an NSO stipulation along the Colorado River for mineral leasing and development (Three Rivers withdrawal) would protect the viewshed of the State scenic byways along Highway 128 and Highway 279 by eliminating the potential for mineral development that would be incompatible with scenic values along the byways.

Allowing mineral industry traffic on the Needles Overlook and Anticline Overlook Roads could lead to heavy truck traffic along these two State scenic backways, which could create poor road conditions, industrial level traffic, and fugitive dust that could degrade viewing and scenic touring opportunities of the backways.

Mineral leasing could reduce the scenic quality of 170 miles of backways and byways within the Planning Area. Two miles of these roads would be open to leasing with standard terms and conditions. About 110 miles of backway and byway would be open to mineral leasing with a CSU stipulation that requires protection of scenic values within 0.5 mile on both sides of the routes. The middle ground and background of the backways and byways would be diminished because there would no protection for visual resources beyond the 0.5 mile distance, thus reducing the effectiveness the CSU stipulation. For example, a potash processing facility could be located within 0.5 mile of a backway or byway. NSO stipulations overlap about 58 miles of backways and byways that would reduce foreground visual impacts by eliminating surface disturbance; however, even where the backways and byways overlap an NSO stipulation, background

mineral operations could still be visible from scenic backways and byways. Table 4-49 shows miles of backways and byways by mineral leasing stipulation and alternative.

Table 4-49. Miles of Backways and Byways by Mineral Leasing Stipulation

	Alternative A	Alternative B1	Alternative B2	Alternative C	Alternative D
Miles of Scenic Backways and Byways within by Oil and Gas Stipulations					
Open	2	0	0	0	0
CSU	110	0	0	0	0
NSO	58	158	174	85	99
Closed	0	0	0	89	59
Deferred (PLA)	0	16	0	0	16
Miles of Scenic Backways and Byways by Potash Stipulations					
Open	2	0	0	0	0
CSU	110	0	0	0	0
NSO	58	16	0	0	16
Deferred (outside PLA)	0	158	174	174	158

Impacts from Alternative B

Applying an NSO stipulation along the Colorado River would have the same impact as under Alternative A.

Limiting the use of heavy trucks on the Needles Overlook and Anticline Overlook Roads could protect the quality of scenic views as well as the driving experience along State backways. Allowing an exception for the use of heavy trucks could increase traffic and raise fugitive dust, which would diminish scenic touring experiences in the backways.

Maximizing the size of oil and gas lease parcels could potentially reduce the number of operators, redundant infrastructure, and corridors, thereby reducing the potential impacts to viewsheds from backways and byways.

The use of BMPs could reduce conflicts between mineral development and scenic backways and byways, as compared to Alternative A where visual BMPs were not specified. Visual screening using natural colors and topography, auditory dampening, and avoidance of recreation areas would all help to protect scenery along these routes.

Applying Baseline CSU stipulations would decrease minerals impacts on backways and byways. Actions such as 2 mile spacing of well pads, collocating facilities, limiting unreclaimed surface disturbance, and placing pipelines along existing roads could limit the visibility and protect the scenic quality of backways and byways.

Applying an NSO stipulation to the mapped viewshed (not to exceed 1 mile) on the entire 170 miles of backways and byways eliminates surface disturbance within the foreground of these scenic roads. However, some distant mineral development could still be visible in the background. This increases the protection of the area surrounding these roads by 109,114 acres as compared to Alternative A. Furthermore,

the NSO stipulation applied to backways and byways in Alternative B is more protective than the CSU stipulation applied in Alternative A.

Impacts Specific to Alternative B1 Only

Designating PLAs and PPFAs could reduce the impacts to scenic backways and byways in those areas. Eliminating the co-development of oil and gas and potash would lessen visual impacts to byways and backways. Potash wells, corridors, and processing facilities, along with the associated traffic, noise, and dust could conflict with scenic backways and byways by altering natural viewsheds beyond the 1 mile of scenic protection. Potash development visible from scenic backways and byways could diminish the quality of scenic touring and driving. A potash processing facility located in the PPFA near Crescent Junction could be visible along the National Scenic Byway on Highway 191 north of Moab. Potash development in the Hatch Point PLA would be visible from Needles and Anticline Overlook State backways, as both travel directly through the PLA.

Impacts Specific to Alternative B2 Only

The Planning Area (785,567 acres) would be open only for oil and gas leasing and would be closed to potash leasing. This would prevent adverse impacts to scenic backways and byways resulting from new potash leasing and development, which were addressed in Alternatives A and B1.

Impacts from Alternative C

In Alternative C, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would result in the same impacts to scenic backways and byways as those described in Alternative B2.

As compared to Alternatives A and B, closing lands along the Colorado River to mineral leasing would add further protection to Highways 128 and 279 by precluding drilling from adjacent lands to access the underlying Federal mineral resources. This would minimize potential impacts that could occur to the viewshed along these highways.

Precluding the use of heavy trucks on the Needles Overlook and Anticline Overlook Roads would protect the quality of visual resources in the Needles/Anticline Overlook State scenic backway compared to Alternatives A and B.

Maximizing the size of oil and gas lease parcels would have the same impacts to backways and byways as those described in Alternative B.

The use of BMPs would have the same impacts to backways and byways as those described in Alternative B.

Applying a Baseline CSU stipulation to oil and gas leasing would have the same impacts to backways and byways as those described in Alternative B.

Applying an NSO stipulation on backways and byways would be similar to Alternative B, except the NSO stipulation would extend out to 2 miles, increasing the area of protection to 267,524 acres as compared to the 156,067 acres of protection in Alternative B. This would eliminate most visual obtrusions on backways and byways, although some very distant oil and gas development could still possibly be seen on the horizon where topography allows distant viewing.

Impacts from Alternative D

Applying an NSO along the Colorado River would have the same impacts to backways and byways as those described in Alternatives A and B.

Limiting the use of heavy trucks on the Needles Overlook and Anticline Overlook Roads would have the same impacts to backways and byways as those described in Alternative B.

The use of BMPs would have the same impacts to backways and byways as those described in Alternatives B and C.

Impacts from applying the Baseline CSU stipulation would have similar impacts to backways and byways as described in Alternatives B and C. However, Alternative D provides an exception to the Baseline CSU stipulation that could result in additional development activity and associated surface disturbance. This exception provided in Alternative D could impact the views from scenic backways and byways. Therefore, Alternative D provides less protection to scenic backways and byways than does Alternatives B and C.

Designating PLAs and PPFAs would have similar impacts to backways and byways as those described in Alternative B1, except that a small-scale potash processing facility could be located within the PLAs. This facility could occupy up to 100 acres, which, depending on the location, could reduce the visual quality of scenic backways and byways.

Applying an NSO stipulation in Alternative D on backways and byways would have similar impacts as those described in Alternative B. However, an exception to the stipulation could be granted if the mineral operation is not visible. This exception could create short-term impacts associated with construction that could reduce the quality of scenic touring opportunities.

4.16 SPECIAL DESIGNATIONS: WILD AND SCENIC RIVERS

This section presents potential impacts to suitable WSRs from implementing management actions presented in Chapter 2. Existing conditions concerning suitable WSRs are described in Chapter 3.

4.16.1 Assumptions

Existing suitable WSR designations would continue.

4.16.2 Impacts Common to All Alternatives

Management actions for threatened and endangered species could prevent surface disturbance and protect vegetation, soils, and scenic values within or adjacent to the suitable WSR segments. These management actions would generally benefit the outstandingly remarkable values (ORV).

4.16.3 Impacts from Alternative A (No Action)

Applying an NSO stipulation to the suitable WSR segments along the Colorado and Green Rivers (19,347 acres) and closing the Monticello WSR Segment 3 along the Colorado River to mineral leasing (753 acres) would prevent mineral development and the associated surface disturbance that could adversely impact vegetation, soils, and scenic values within suitable WSR segments. Preventing surface disturbance could support the ORVs of these rivers.

4.16.4 Impacts from Alternative B

Impacts to suitable WSRs would be the same as those described in Alternative A.

4.16.5 Impacts from Alternative C

Impacts to suitable WSRs would be similar to those described in Alternatives A and B, except that mineral closures would add further protection to these suitable WSRs where scenery is an ORV. Closing these suitable WSRs to mineral leasing would preclude drilling from adjacent lands in order to access the underlying Federal mineral resources.

4.16.6 Impacts from Alternative D

Impacts to suitable WSRs are the same as those described in Alternatives A and B.

4.17 SPECIAL STATUS SPECIES

Special status species include 1) those listed as threatened or endangered, are proposed for listing; 2) candidates for listing under the provisions of the Endangered Species Act (ESA); 3) those listed by a State implying potential endangerment or extinction; and 4) those designated by the BLM State Director as sensitive. The BLM defines sensitive species as those that could easily become endangered or extinct in a State unless protection is granted. Designated sensitive species are provided the same level of protection by the BLM as Federal candidate species. In compliance with the ESA, the BLM will evaluate all proposed actions to determine if individuals or populations of Federally listed species or their habitat, including designated critical habitat may be affected (BLM Manual 6840).

Over the life of the plan, some species that are currently considered sensitive, or not formally included in the BLM's sensitive species list, may be listed under the ESA. Some currently listed species may be delisted during the life of the plan. Most species that are delisted or downgraded from Federally proposed or candidate status will be included on the BLM sensitive species list. Endangered Colorado River fish are referenced under that heading within this section and consist of bonytail (*Gila elegans*), Colorado pikeminnow (*Ptychochelius lucius*), humpback chub (*Gila cypha*), and razorback sucker (*Xyrauchen texanus*).

4.17.1 Assumptions

- Local populations are naturally affected by non-human-caused factors such as climate, natural predation, disease outbreaks, natural fire regimes, and competition for available habitat from other native species.

- Climatic fluctuation would continue to influence the health and productivity of special status wildlife habitat on an annual basis.

- Actions impacting one species have similar impacts on other species using the same habitats or areas.

- Ground disturbing activities could lead to modification (positive or negative), loss (short-term or long-term), or fragmentation of special status species habitat and/or loss or gain of individuals, depending on the amount of area disturbed, species affected, and location of the disturbance.

- Changes in air, water, and habitat quality could lead to direct impacts and could have cumulative impacts on species survival.

- Impacts to special status species could be more significant than impacts to non–special status species.

- The USFWS would be consulted on any action that could potentially affect any listed plant or animal species or their habitat.

- USFWS would have jurisdiction over the management of Federally listed fish, wildlife and plant populations, critical habitat, and migratory birds.

- The total amount of new surface disturbance allowed by an alternative is a good index of potential impacts to special status species. Success of reclamation measures prescribed as a condition of development is unknown, and could underestimate the potential impact of surface disturbance on special status species populations.

- Adequate vegetative ground cover and species composition for site stabilization typically would occur within 10 to 15 years in shrub communities and 15 to 20 years in desert communities.

- Re-establishment of slow growing vegetation, such as trees and shrubs, in disturbed areas would create a vegetative landscape similar to adjacent undisturbed lands in excess of 100-years.

- The health of fisheries within the Planning Area is directly related to the overall health and functional capabilities of riparian/wetland resources, which in turn reflect watershed health.

4.17.2 Impacts Common to All Alternatives

The following discussions represent impacts to special status species habitat that would not vary by alternative.

Management to support air quality and the use of dust abatement measures could support the health of vegetation by reducing dust accumulation on foliage, through reducing airborne pollutants or particulate matter, which could damage vegetation and reduce sediment accumulation in stream channels. The management would support forage resources for special status wildlife and water quality and habitat for special status fish.

Closing the Monticello WSR Segment 3 to mineral leasing (753 acres) would prevent surface disturbance from leasing activities, and protect adjacent riparian or upland habitat from degradation or damage as a result of erosion and runoff. The closure to future leasing activities would protect riparian and upland vegetation, reduce sedimentation and siltation of streambeds, and support water quality. The prevention of surface disturbance could reduce the potential for the introduction and spread of invasive, non-native plant species, providing additional protection to stream health and fish habitat. Habitat for endangered Colorado River fish would be protected through closing the river segment to future mineral development. Wildlife that use riparian, upland, and wetland habitat such as Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), bald eagle (*Haliaeetus leucocephalus*), and Southwestern willow flycatcher *(Empidonax traillii extimus)* would benefit from the undisturbed habitat and forage, and reduced presence of humans and machinery associated with mineral leasing.

Raptor management requiring the use of *Best Management Practices for Raptors and Their Associated Habitats in Utah* would directly benefit raptor species, such as Mexican spotted owl (*Strix occidentalis lucida*), bald eagle, short-eared owl (*Asio flammeus)* and their habitat by reducing disturbing activities and human presence, which allows species to remain in desired habitat for hunting, nesting, and reproduction. Maintaining and enhancing habitat for raptors would directly benefit those species by providing desired nesting and foraging habitat. Other wildlife species would also benefit from spatial buffers and habitat protection from reduced disturbance from humans and development activities, protecting cover, forage and habitat corridors.

Management for migratory birds may help protect habitat and forage from damage or disturbance during nesting season. This management would protect habitat for species such as bobolink (*Dolichonyx oryzivorus*) and Southwestern willow flycatcher from April 1 to July 31, and could provide protection to other special status species that share the habitat, such as Western yellow-billed cuckoo, cornsnake (*Elaphe guttata*), and Western red bat (*Lasiurus blossevillii*).

Use of lease notices and conservation measures, for threatened, endangered, and BLM special status species would protect those species, their critical habitat, and other habitat necessary for their continued existence.

No surface-disturbing activities would be allowed within the 100-year floodplain of the Colorado River, Green River, and associated back waters (19,198 acres). This would protect water quality and prevent soil erosion and runoff that could lead to streambank or channel erosion and the cementation of spawning gravels. Precluding surface-disturbing activities would retain riparian and upland vegetation, which could help maintain water temperature and stabilize streambanks. This management would directly protect aquatic and riparian habitat for endangered Colorado River fish, flannelmouth sucker (*Catostomus latipinnis*), roundtail chub (*Gila robusta),* Western yellow-billed cuckoo, and bobolink Southwestern willow flycatcher.

Mexican spotted owl and other special status plant and wildlife species associated with critical habitat, suitable, or occupied habitat for Mexican spotted owl would be protected from damage, removal, or loss of habitat resulting from surface-disturbing activities and other disruptive actions. Seasonal avoidance limitations or minimization of disturbance would reduce the potential of Mexican spotted owl and other special status wildlife, such as the California condor (*Gymnogyps californianus*), from abandoning habitat during these timeframes (175,304 acres).

Suitable habitat for Southwestern willow flycatcher, as well as habitat for other special status plant and wildlife species would be protected from damage, removal, or loss from surface-disturbing activities and other disruptive actions (12,155 acres). The stipulations could prevent runoff into aquatic habitat, support water quality, and protect riparian areas from sedimentation and erosion. Seasonal preclusions of disturbance could reduce the potential of Southwestern willow flycatcher and other special status wildlife such as yellow-billed cuckoo and bobolink from abandoning habitat during these timeframes.

Suitable habitat for yellow-billed cuckoo, as well as habitat for other special status plant and wildlife species, would be protected from damage, removal, or loss from surface-disturbing activities and other disruptive actions (12,155 acres). The stipulations could prevent runoff into aquatic habitat, support water quality, and protect riparian areas from sedimentation and erosion. Seasonal preclusions of disturbance would prevent yellow-billed cuckoo and other special status wildlife, such as fringed myotis (*Myotis thysanodes*) and Southwestern willow flycatcher, from abandoning habitat during these timeframes.

Habitat for bald eagles as well as other special status plant or wildlife species could be protected from damage or removal within the 0.5 mile buffers for permanent structures. Seasonal preclusions of disturbance would prevent bald eagles or other special status wildlife, such as yellow billed cuckoo and Southwestern willow flycatcher, from abandoning habitat during these timeframes.

Habitat for golden eagles (*Aquila chrysaetos*), as well as other special status plant or wildlife species, could be protected from damage or removal by precluding surface-disturbing activities within 0.5 mile of documented nest sites during the specified nesting seasons. Seasonal preclusions of disturbance would reduce the potential of golden eagles or other special status wildlife, such as ferruginous hawk and Mexican spotted owl from abandoning habitat during these timeframes.

Habitat for burrowing owl, as well as other special status plant or wildlife species, could be protected from damage or removal by precluding surface-disturbing activities within 0.25 mile of documented nest sites during the specified nesting season. Seasonal preclusions of disturbance would prevent burrowing owl or other special status wildlife, such as Mexican spotted owl and bald eagle, from abandoning habitat during these timeframes.

Habitat for ferruginous hawk, as well as other special status plant or wildlife species, could be protected from damage or removal by precluding surface-disturbing activities within 0.5 mile of documented nest sites during the specified nesting season. Seasonal preclusions of disturbance would prevent ferruginous

hawk or other special status wildlife such as burrowing owl from abandoning habitat during these timeframes.

Habitat for Gunnison prairie dogs (*Cynomys gunnisoni)* or other special status plant or wildlife species such as burrowing owl could be protected from damage or removal within the 660 foot buffer areas within colonies. Small special status wildlife species would benefit from the perceived or actual reduction of overhead predators.

Habitat for kit fox (*Vulpes macrotix*) or other special status plant or wildlife species could be protected from damage or removal within the 660 foot buffer areas surrounding occupied kit fox dens.

Habitat for California condor or other special status plant or wildlife species could be protected from damage or removal and from permanent infrastructure within the 1.0 and 0.5 mile buffers. Seasonal preclusions of disturbance would prevent California condor or other special status wildlife from abandoning habitat during these timeframes. Preventing infrastructure would reduce disturbance to the Condor or other wildlife, such as Mexican spotted owl and Gunnison prairie dog, and would provide unobstructed corridors for wildlife movement.

4.17.3 Impacts from Alternative A (No Action)

Applying an NSO stipulation for oil and gas leasing within the existing Three Rivers mineral withdrawal for locatable minerals could provide greater protection to 14,654 acres of endangered Colorado River fish habitat and other special status wildlife habitat within the withdrawal area. The NSO stipulation could prevent soil loss, erosion, or sedimentation of spawning habitat; could prevent the loss or damage to in-stream, riparian, or upland habitat, and could prevent or reduce the introduction and spread of invasive, non-native plant species from future oil and gas leases within the 23,441 acres. The NSO stipulation could prevent damage or removal of wildlife cover and forage, reducing fragmentation of habitat, and could prevent disturbance of wildlife. The stipulation could provide protection to downstream habitat for other special status fish such as flannelmouth sucker and roundtail chub, and other riparian species, such as yellow-billed cuckoo, Western red bat (*Lasiurus blossevillii*), and Southwestern willow flycatcher, and would support water quality within the Green River and Colorado River corridor.

Under Alternative A, oil and gas and potash leasing and development could occur concurrently within the same tract of land, which could result in a greater concentration of development and redundant infrastructure. Although drilling for oil and gas and potash is similar, the production of potash requires the use of potash processing facilities, which involve large tracts of land over a long period of time. Any area where oil, gas or potash leasing and development occurs would cause surface disturbance resulting in both short–term and long–term habitat loss, fragmented habitat, and the increased potential for the introduction and spread of invasive, non-native plant species, and further degrading habitat conditions for special status species. Direct habitat loss or degradation of habitat would force special status species to relocate to other areas where competition for forage and other habitat resources would increase. Increased competition for resources could lead to decreased health and reproduction, and could result in increased predation or mortality. Habitat for special status plants could become damaged or lost from development and direct takes could occur if surveys were not conducted.

Mineral disturbance near special status raptor and other avian nesting sites, such as the bald eagle, ferruginous hawk, and long-billed curlew (*Numenius americanus*) could result in the abandonment of nests, high nestling mortality from overheating, chilling, or desiccation when young are left unattended; premature fledging, and ejection of eggs or young from the nest. Raptors are less tolerant of disturbance when populations of prey species are at low levels (Romin and Muck 2002).

Construction of linear disturbances, such as pipelines and roadways associated with mineral development, would fragment wildlife habitat and would make the areas that are vulnerable to the introduction and spread of invasive, non-native plant species. Vehicle use could result in the injury or mortality of special status species if collisions were to occur. Predatory wildlife (kit fox and raptors) may use road and pipeline corridors for hunting small prey species (Gunnison's prairie dog, Mogollon vole (*Microtus mogollonensis*), and Great Plains toad (*Bufo cognatus*)). The development of pipelines and roadways could be beneficial to the predators, possibly increasing availability of prey species, but could also increase predation on the smaller wildlife within or adjacent to the corridors. Runoff from development could lead to streambank erosion, vegetation loss, sedimentation of streambeds, and stream channel alteration, as well as reducing the quality of habitat for special status fish and other wetland and riparian species.

In Alternative A, approximately 476 acres of land could initially be removed for oil and gas development in the next 15 years, which would result in direct loss of habitat, forage and cover for wildlife and could lead to the introduction and spread of noxious weeds, leading to further degradation of the ecosystem. Over the long-term, reclamation would occur and vegetation would re-establish within 133 acres, leaving only 343 acres of habitat for special status species permanently removed by oil and gas operations.

Allowing oil and gas leasing on 210,884 acres subject to standard terms and conditions (open) would result in the damage or removal of special status wildlife habitat from the development of well pads and associated infrastructure. Invasive, non-native plant species could be introduced and spread by vehicles and machinery during development activities, which could change habitat composition and function, reducing forage quality and usable habitat for wildlife species. Runoff from development could lead to streambank erosion, vegetation loss, sedimentation of streambeds, and stream channel alteration; reducing the quality of habitat for aquatic species and special status fish. The largest areas of vegetation within the open areas that could be developed includes blackbrush (76,635 acres), which contains hunting range or habitat for kit fox and ferruginous hawk; and pinyon-juniper (64,731 acres), which contains habitat for Townsend's big-eared bat (*Corynorhinus townsendii*), short-eared owl, and fringed myotis (UDWR 2005b). The largest areas of habitat for special status species that could be damaged, lost, or disturbed through mineral development is for Mexican spotted owl (76,269 acres), burrowing owl (102,756 acres), and bald eagle (10,186 acres). The ESA and lease notices would provide protection to threatened and endangered species, but impacts could occur to unlisted, special status, or sensitive species. Acres of habitat for other special status species within the lands open for oil and gas development are shown in Table 4-50.

Applying CSU and TL stipulations in Alternative A to oil and gas leasing could reduce loss, damage, or degradation of habitat for special status species within 440,386 acres. Timing limitations would prevent surface disturbance during specific timeframes, which could protect special status wildlife during the periods of closure from disruption or disturbance from humans or machinery. Adjusting timing of disturbance could allow wildlife to remain in desired habitat during sensitive timeframes and within important habitat, such as hunting and nesting habitat, a limiting factor for avian species' health and survival. Disturbance, damage or loss of habitat could occur outside of the seasonal closures, ultimately leading to some loss of habitat from oil and gas development. The CSU stipulations could reduce disturbance, habitat loss or damage, erosion, runoff, and the introduction and spread of invasive, non-native plant species. The largest area of vegetation that is covered by the CSU and TL stipulations is pinyon-juniper, which provides habitat for ferruginous hawk, short-eared owl, fringed myotis, and Entrada rushpink (*Lygodesmia grandifolia* var. *entrada*) (Table 4-55).

Applying an NSO stipulation in Alternative A for oil and gas leasing would prevent surface-disturbing activities from oil and gas development within 133,574 acres. The NSO stipulation could protect wildlife and plant habitat (including Jones cycladenia) from damage, removal or degradation; reduce the presence of infrastructure, humans, and machinery; and reduce habitat fragmentation. Removing future disturbance from roads, structures, drilling operations, and human disturbance associated with oil and gas development

could reduce a majority of stressors and disruption of habitat and could allow for continued habitat connectivity. The NSO stipulation could prevent future barriers in migration corridors for big game and other migratory wildlife species allowing wildlife to move between crucial winter ranges, parturition, breeding, or nesting habitat, and would provide overall habitat protection. The prevention of surface disturbance would reduce the potential for the introduction and spread of invasive, non-native plant species, supporting intact habitat and desired forage and cover for wildlife. The largest area of habitat protected under the NSO stipulation would be pinyon-juniper (68,485 acres, Table 4-55), which contains habitat for Townsend's big-eared bat, short-eared owl, fringed myotis, and Trotter's oreoxis (*Oreoxis trotteri*). The NSO stipulation could prevent soil loss, erosion, or sedimentation of streambeds; could support water quality, and provide protection of habitat for special status fish and other aquatic species. Table 4-50 shows other special status species receiving habitat protection under the NSO stipulation for Alternative A.

Closing 753 acres to oil and gas leasing would prevent damage or loss of wildlife habitat from development activities, reduce disturbance to wildlife from the presence of humans, vehicles or machinery; prevent erosion or runoff, and protect an intact ecosystem. The closed acres are adjacent to the Colorado River and would protect important habitat for endangered Colorado River fish and special status fish species, such as roundtail chub, and flannelmouth sucker; support avian species such as Southwestern willow flycatcher, yellow billed cuckoo, and bobolink; protect habitat for other wetland and riparian wildlife species, and would support water quality within the Colorado River corridor. The entire 753 closed acres contain Mexican spotted owl and bald eagle habitat, which would be directly protected from damage and disturbance by oil and gas development (Table 4-50). Precluding oil and gas development would prevent the introduction and spread of invasive, non-native plant species from machinery and vehicles, further supporting desired forage, cover, and contiguous habitat. The largest area of vegetation type is pinyon-juniper (528 acres) followed by salt desert shrub (214 acres), which could also provide undisturbed habitat conditions for species such as Townsend's big eared bat, spotted bat, or short-eared owl.

Table 4-50. Special Status Species Habitat by Oil and Gas Leasing Management Category for All Alternatives

Management Category	Alternative A (acres)	Alternative B1 (acres)	Alternative B2 (acres)	Alternative C (acres)	Alternative D (acres)
Mexican Spotted Owl Habitat (Threatened)					
Open	76,269	0	0	0	0
CSU/TL	231,814	71,688	83,090	18,304	71,820
NSO	77,228	278,146	299,381	252,101	184,654
Closed	753	753	753	112,819	94,112
Southwestern Willow Flycatcher (Endangered) and Yellow-billed Cuckoo Habitat (Threatened)					
Open	1,887	0	0	0	0
CSU/TL	5,480	140	156	10	143
NSO	7,477	10,777	11,849	6,600	8,169
Closed	136	136	136	5,531	2,741
Endangered Colorado River Fish Habitat					
Open	20	0	0	0	0
CSU/TL	1,422	0	0	0	0
NSO	20,644	18,580	19,176	774	13,038
Closed	195	195	195	18,424	5,565

Management Category	Alternative A (acres)	Alternative B1 (acres)	Alternative B2 (acres)	Alternative C (acres)	Alternative D (acres)
Jones Cycladenia (Threatened), Known Locations					
Open	0	0	0	0	0
CSU/TL	0	0	0	0	0
NSO	1	1	1	0	0
Closed	0	0	0	1	1
Gunnison Prairie Dog Habitat (BLM Special Status Species)					
Open	201	0	0	0	0
CSU/TL	6,702	3,933	3,933	1,093	4,109
NSO	2	2,819	2,891	5733	2,715
Closed	0	0	0	0	0
Ferruginous Hawk Habitat (BLM Special Status Species)					
Open	2,329	0	0	0	0
CSU/TL	26,843	24,470	24,470	8,418	24,470
NSO	0	4,683	4,683	20,442	4,390
Closed	0	0	0	294	294
Burrowing Owl Habitat (BLM Special Status Species)					
Open	102,756	0	0	0	0
CSU/TL	151,569	107,707	129,963	20,612	108,652
NSO	30,837	145,014	154,622	203,238	88,674
Closed	22	15	15	60,749	55,410
Bald Eagle Habitat (BLM Special Status Species)					
Open	10,186	0	0	0	0
CSU/TL	114,639	38,999	52,981	14,541	39,870
NSO	6,918	64,497	77,717	98,363	51,465
Closed	753	563	563	18,356	12,725
Sensitive Plant Habitat					
Open	2,874	0	0	0	0
CSU/TL	46,481	13,162	13,394	4,138	14,351
NSO	12,896	45,594	48,197	38,223	25,520
Closed	0	0	0	19,230	18,886

In Alternative A, approximately 1,223 acres of vegetation could be removed for potash well drilling (production and non-production wells) in the next 15 years, which would result in direct loss of vegetation resources and topsoil, and could lead to the introduction and spread of invasive, non-native plant species. Over the long term, reclamation would occur and vegetation resources could re-establish within 408 acres, leaving 815 acres of net surface disturbance within potential wildlife habitat.

Under Alternative A, impacts from potash well drilling would be the same as described for the areas managed for oil and gas leasing as open with standard terms and conditions, the application of CSU, TL, and NSO lease stipulations, and closing lands to mineral development as described above.

Management for potash processing could allow processing facilities to be developed where existing stipulations do not preclude surface disturbance (NSO and closed). This means that potash processing facilities could be constructed in the 210,884 acres of open to leasing with standards terms and conditions (open) areas or possibly within the 440,386 acres of lands with CSU and TL stipulations. Development of processing facilities could permanently remove up to 3,716 acres for solar evaporation processing, or 500 acres for crystallization processing. The loss of habitat would continue through the life of the Moab MLP. Development of processing facilities would result in the damage, degradation, fragmentation, or removal of habitat, and disturbance from humans, construction activities, or vehicle traffic. Direct habitat loss or degradation of habitat would force special status wildlife to relocate to other areas where competition for forage and other habitat resources could increase. Increased competition for resources could lead to decreased health and reproduction, and could result in increased predation or mortality. Invasive, non-native plant species could be introduced and spread by vehicles and machinery during operation of the facilities, which could change vegetation composition and function, making habitat inhospitable for native plant species and could lead to further losses of habitat for special status species. Sensitive plant habitat occurs within 2,874 acres of open areas where facilities could be constructed. Special status plant species are subject to direct removal if overlooked in surveys, and they are also vulnerable to soil loss and erosion, in addition to the spread of invasive, non-native plant species, which thrive in disturbed conditions and could out-compete special status plants for soil, light and hydrologic resources.

Construction or operation of potash processing facilities could disturb avian and other special status wildlife species if they were to occur within occupied habitat, possibly causing species to vacate the area to lower quality habitat. Moving from desirable habitat could result in reduced health of animals, making them susceptible to disease or predation. Where development occurs near sensitive habitat for raptors, such as nesting or other limited habitat, the health of the populations can be impacted through reduced reproduction or by limiting the availability of valuable forage resources during sensitive timeframes (Sawyer 2002). Vehicle use could result in the injury or mortality of wildlife species if collisions were to occur. Predatory wildlife (kit fox and raptors) could use road and pipelines for hunting small prey species (Great Plains toad and Mogollon vole). The presence of pipelines and roadways would be beneficial to the predators, but could increase predation on the smaller wildlife within the corridors. Runoff from development could lead to streambank erosion, vegetation loss, sedimentation of streambeds, and stream channel alteration, which could reduce the quality of habitat for special status fish or riparian species.

Applying a TL stipulation for mineral leasing (for both oil and gas and potash) that prohibits surface-disturbing activities on saline soils within 68,275 acres from December 1 to May 31, could reduce damage or removal of habitat, reduce soil loss and erosion, and prevent saline runoff, which could damage sensitive vegetation resources or special status species habitat. This area contains habitat for Cisco milkvetch (*Astragalus sabulous* var. *sabulous*); the management could protect this plant or habitat for this plant species at least seasonally, if not year round.

Management for salinity control, sensitive soils, drought management, and applying BMPs to all oil and gas authorizations in accordance to WO IM 2007-021 and the most current version of the *Gold Book* could provide protection to special status species habitat, reduce erosion and soil loss, prevent the establishment or spread of invasive, non-native plant species, and support reclamation and revegetation efforts. The BMPs would protect special status wildlife from hazards, prevent degradation of riparian habitat, and could help reduce habitat fragmentation; supporting continued habitat function and value for special status plants, fish and wildlife species where the BMPs and other management were applied.

Applying mineral leasing stipulations for steep slopes (Table 4-56) could reduce or prevent surface disturbance to habitat for special status species, protect vegetation and soils from damage or loss, and could prevent or reduce erosion. The stipulations would directly protect or minimize damage or loss of hillside and downslope vegetation; and could prevent landslides and heavy erosion on slopes that could result in larger losses of habitat. Additional erosion control plans could reduce habitat damage or loss, soil loss, and runoff in areas where development occurs. Habitat for big-eared bat, and possibly Canyonlands lomatium (*Lomatium latilobum*) could be protected by the NSO and CSU stipulations, which could minimize or prevent disturbance to soils, forage, cover, corridors, and nesting habitat for avian and other special status wildlife.

BMPs for water quality could support the health of upland and riparian habitat for special status species, could provide continued availability of water resources for special status wildlife, and could protect water quality for special status fish and other aquatic wildlife species.

Applying an NSO stipulation within public water reserves, 100-year floodplains, within 330 feet of riparian areas and springs could protect 50,495 acres of wetland, riparian, and aquatic habitat for special status fish and other riparian species dependent on these ecosystems. Applying an NSO stipulation for mineral leasing to the suitable WSR segments along the Colorado and Green Rivers (with the exception of Colorado River Segment 3 in Monticello) (19,347 acres) could prevent surface disturbance from mineral leasing activities, and protect adjacent riparian or upland habitat from degradation or damage as a result of erosion and runoff. The NSO stipulations could prevent runoff into aquatic systems, preventing siltation of spawning habitat, improving water quality, and preventing erosion of streambanks, thereby protecting endangered Colorado River fish species. Reducing runoff and erosion would protect riparian and other vegetation from damage or further soil loss and could reduce the potential for the introduction and spread of invasive, non-native plant species, providing additional protection to downstream habitat and corridor function. Special status wildlife that use riparian, upland, and wetland habitat such as bald eagle, Southwestern willow flycatcher, yellow-billed cuckoo, and Western red bat, would benefit from the undisturbed habitat, forage, and access to water sources, and reduced presence of humans and machinery associated with mineral development.

Avoiding or minimizing loss of sagebrush steppe habitat on a case-by-case basis could reduce habitat loss and reduced disturbance of special status wildlife within this vegetation community, as well as the prevention of direct habitat loss or degradation. Where this management is applied, special status wildlife such as Gunnison prairie dog, kit fox, and ferruginous hawk would benefit from intact habitat and reduced disturbance from development. Where mineral development in sagebrush results in reclamation, habitat for sagebrush species could be mitigated over the long-term. Revegetation of sagebrush habitat may take anywhere between 10 to 50 years to establish and mature, depending on soils, climate, and rainfall. The initial mitigation projects could displace special status wildlife species from human and vehicle presence, causing wildlife to flee to other, possibly lower quality habitat. Displacement could cause short-term impacts to special status wildlife from stress from fleeing, as well as inadequate forage, shelter or breeding habitat.

The use of native seed mixes on a case-by-case basis for restoration and rehabilitation would support the growth of native vegetation communities that would provide ideal forage, cover and habitat for wildlife when areas have been rehabilitated. Areas that restore with native plant composition provide habitat and cover for special status wildlife species and can support healthy species populations. Use of non-native species could help stabilize soils, prevent erosion, and reduce the establishment and spread of invasive or noxious plant species in the short-term. Over the long-term, non-native species could provide stable substrate for native species to then re-establish and provide suitable habitat for wildlife. Preventing the infestation and spread of noxious weeds or controlling noxious weed species on a case-by-case basis would support the health and vitality of native habitat for wildlife and special status plant species and help to

reduce competition with native plant species for soil, water and solar resources; allowing special status plant species to thrive and provide intact native habitat for special status wildlife.

4.17.4 Impacts from Alternative B

Impacts to special status species from applying an NSO stipulation for the Three Rivers mineral withdrawal would be the same as Alternative A.

Under Alternative B, maximizing oil and gas lease size and applying the Baseline CSU stipulation to sensitive resources would result in reducing or eliminating redundant infrastructure from oil and gas development. This in turn could reduce loss, damage, or degradation of special status species habitat, which could allow for more contiguous habitat for special status wildlife. Minimizing mineral related infrastructure could reduce barriers to migration and other travel corridors for special status wildlife. Less surface disturbance could provide higher quality habitats for special status species compared to Alternative A, where this management is not applied. Reducing surface disturbance could reduce the potential for the introduction and spread of invasive, non-native plant species, further protecting habitat for special status plants and the quality and availability of suitable habitat for special status wildlife.

Applying the Baseline CSU stipulation for all mineral development, 208,185 acres in Alternative B1 and 222,289 acres in Alternative B2, could reduce surface disturbance when compared to Alternative A, which primarily consists of timing restrictions. The Baseline CSU could reduce or minimize surface disturbance, reduce removal or degradation of special status species habitat, provide additional protections for fish and wildlife habitat, and could provide offsite reclamation for areas that are developed. Minimizing density of development could allow for fewer barriers of movement for special status wildlife species from well pads and other infrastructure, and could reduce fragmentation of habitat. Less fragmented habitat could protect special status wildlife from human and other disturbances and could provide larger areas for species to breed, migrate, forage, seek cover, and complete their life histories as compared to Alternative A. The Baseline CSU could reduce soil erosion and runoff into nearby riparian areas, leading to less sedimentation of spawning habitat for special status fish, and could maintain or improve water quality for other aquatic species.

Applying BMPs, as appropriate, to mineral operations (oil and gas and potash) would provide greater protection to special status species as compared to Alternative A. The BMPs would provide support for wildlife habitat that would minimize impacts through project design or mitigation. The BMPs include reclamation and restoration requirements, including greater management for seeding and controlling noxious weeds as compared to Alternative A. The BMPs could allow for revegetation of native vegetation communities as development activities are completed which would support overall ecosystem health and provide a variety of seral stages of vegetation. BMPs for noise could further reduce disturbance to special status wildlife and could prevent some wildlife from abandoning habitat due sound levels from development activity or well pad operations.

Applying a CSU stipulation for mineral leasing for offsite reclamation in areas of saline soils could provide soil stability and help reduce vegetation loss, soil erosion, and runoff if reclamation efforts were successful. Applying a CSU stipulation for mineral leasing on steep slopes greater than 21 percent (Table 4-56) and avoiding development, where possible, could reduce or prevent surface disturbance to habitat for special status species, protect vegetation and soils from damage or loss, and could prevent or reduce erosion. The stipulations would directly protect or minimize damage or loss of hillside and downslope vegetation, and could prevent landslides and heavy erosion on slopes, thereby reducing larger losses of habitat. These CSU stipulations could protect habitat for special status species to a greater degree as compared to Alternative A. Preventing or reducing erosion, soil loss, and runoff would reduce sedimentation of spawning gravel, and

would protect in-stream habitat from reduced water quality and channel degradation. Additional erosion control plans could reduce habitat damage or loss, soil loss, and runoff in areas where development occurs.

Applying an NSO stipulation to preclude mineral activities within public water reserves, 100-year floodplains and within 500 feet of intermittent and perennial streams, rivers, riparian areas, wetlands, water wells, lakes, springs (69,786 acres) and 750 foot buffers on the Colorado River and Fisher Creek (4,590 acres) provides greater protection for wildlife habitat as compared to Alternative A with larger buffer distances (170 feet larger) and additional acreage (23,881 more acres). Impacts to habitat for special status fish and other special status species would be similar to Alternative A. However the larger area of protection would allow for greater protection of aquatic, riparian, wetland, and upland habitat; greater access to water sources for wildlife, less disturbance or disruption of special status wildlife from mineral development, and access to uninterrupted, contiguous habitat for wildlife movement or migration.

Measures to protect water quality in aquifers and watersheds from mineral development include applying a CSU stipulation to important spring areas requiring a hydrologic assessment prior to conducting any mineral operations (38,056 acres), applying the Baseline CSU stipulation to the Courthouse Wash Watershed (51,790 acres) and applying a CSU stipulation requiring closed loop drilling to this watershed, applying the Baseline CSU stipulation to the Salt Wash Watershed (61,925 acres), and applying BMPs for the protection of shallow and potential unconsolidated aquifers. This management could support downstream special status fish habitat and provide clean water sources for special status wildlife use. Alternative A did not address these water resources.

Impacts to special status species from applying an NSO stipulation to the suitable WSR segments along the Colorado and Green Rivers would be the same as Alternative A.

Applying a CSU stipulation for conducting surveys to avoid special status plants would directly protect these plants and surrounding habitat from removal, soil loss, erosion, and reduced population numbers (61,591 acres). The CSU stipulation could also reduce damage or removal of special status wildlife cover and forage, reduce fragmentation of habitat, and reduce disturbance of wildlife.

Impacts Specific to Alternative B1 Only

Not issuing oil and gas leases within PLAs (103,619 acres) could reduce the concentration of development and redundant infrastructure within the PLAs, resulting in less damage or removal of vegetation, which could allow for more contiguous special status species habitat, and would create fewer disturbed areas of lost or damaged habitat compared to Alternative A. However, 43 percent of the Hatch Point PLA contains existing oil and gas leases. Therefore, there is potential for concurrent development of oil and gas and potash on these existing leases and a greater likelihood for adverse impacts to special status species in the Hatch Point PLA. The reduction of surface disturbance could reduce the potential for the introduction and spread of invasive, non-native plant species, supporting intact habitat and desired forage and cover for special status species. Reducing the level of development within PLAs could reduce runoff into aquatic systems, preventing siltation of spawning habitat, improving water quality, and preventing erosion of streambanks. Reducing runoff and erosion would protect riparian and other vegetation from damage or further soil loss and could reduce the potential for the introduction and spread of invasive, non-native plant species, providing additional protection to downstream habitat and corridor function. Less surface disturbance could provide higher quality habitat for special status species compared to Alternative A, where this management is not applied. Alternative B1 does not allow potash leasing on 681,948 acres within the Planning Area, which would minimize adverse impacts to special status species from concurrent oil and gas and potash development, including potash processing facilities as compared to Alternative A.

A phased approach to potash leasing could help reduce impacts to special status species as compared to Alternative A. By testing the feasibility of potash development, unnecessary surface disturbance would be avoided and appropriate mitigation measures applied. These measures could benefit special status species.

Applying a CSU stipulation to all potash leases that requires processing facilities to be located within a PPFA within 42,492 acres would localize the disturbance and infrastructure to the PPFAs (located in areas of lower quality habitat and where infrastructure is already in place) and prevent large-scale disturbance and habitat loss from potash processing in other areas in the Planning Area. The PPFAs could minimize the amount of disturbance from potash processing as compared to Alternative A where 210,884 acres of open areas or possibly 440,386 acres of lands with CSU and TL stipulations could be developed for potash processing. Limiting the area available for PPFAs in Alternative B1 could reduce the overall loss of habitat by preventing the location of facilities outside of the PPFAs in areas with more sensitive habitat and in a reduction in the amount of surface disturbance (from 4,216 acres to 3,037 acres) associated with processing facilities as compared to Alternative A. Table 4-57 shows the types of vegetation within the proposed PPFAs and Table 4-51 shows the acres of special status species habitat within the PPFAs.

Within the PPFAs, an NSO stipulation for ephemeral drainages would protect habitat for terrestrial special status wildlife and special status plant species, with the largest areas of habitat protection for the burrowing owl (1,687 acres) and Mexican spotted owl (104 acres) (Table 4-51). Habitat for other special status species, such as kit fox, Paradox breadroot (*Pediomelum aromaticum* var. *tuhyi*), and fringed myotis would be protected within 1,627 acres of salt desert shrub and 239 acres of pinyon-juniper within the NSO areas. The remaining CSU/TL areas would allow for controlled development, with the greatest possible losses of vegetation types being within salt desert shrub (21,566 acres) and sagebrush (8,075 acres). Habitat for the burrowing owl (25,428 acres) has the greatest area of overlap with the CSU/TL stipulation areas, with much smaller areas of habitat for Gunnison prairie dog (2,766 acres), and 2,502 acres of bald eagle habitat.

Table 4-51. Special Status Species Habitat by Potash Leasing Stipulation within the Potash Processing Facility Areas for Alternatives B1 and D (only)

Leasing Stipulation	PPFA Alternative B1 (acres)	PPFA Alternative D (acres)
Mexican Spotted Owl Habitat (Threatened)		
CSU/TL	889	889
NSO	104	104
Southwestern Willow Flycatcher (Endangered) and Yellow-billed Cuckoo Habitat (Threatened)		
CSU/TL	17	17
NSO	10	10
Endangered Colorado River Fish Habitat		
CSU/TL	0	0
NSO	0	0
Gunnison Prairie Dog Habitat (BLM Special Status Species)		
CSU/TL	2,766	2,766
NSO	112	112
Ferruginous Hawk Habitat (BLM Special Status Species)		
CSU/TL	2,158	2,158

Leasing Stipulation	PPFA Alternative B1 (acres)	PPFA Alternative D (acres)
NSO	171	171
Burrowing Owl Habitat (BLM Special Status Species)		
CSU/TL	25,428	25,423
NSO	1,687	1,693
Bald Eagle Habitat (BLM Special Status Species)		
CSU/TL	2,502	2,502
NSO	190	190
Sensitive Plant Habitat		
CSU/TL	936	936
NSO	47	47

Under Alternative B1, there are zero acres managed as open to oil and gas and potash leasing with standard terms and conditions as compared with the 210,884 acres in Alternative A. Therefore, Alternative B1 could result in less mineral development and damage or removal of special status species habitat as compared to Alternative A.

Applying CSU and TL stipulations could reduce damage or loss of vegetation resources within 228,926 acres for oil and gas. Applying CSU stipulations, which includes the Baseline CSU stipulation, could minimize density of disturbance, reduce conflicts of development, and support reclamation and mitigation activities when development does occur. These CSU stipulations could reduce or minimize surface disturbance, reduce removal or degradation of habitat for special status species, provide additional protections for special status wildlife habitat, and could provide offsite reclamation for areas that are developed. Minimizing density of development could allow for fewer barriers of movement for wildlife species from well pads and other infrastructure, and could reduce fragmentation of habitat. Reducing habitat fragmentation could protect special status wildlife from human and other disturbance and could provide larger areas for species to breed, nest, migrate, forage, seek cover, and complete their life histories. This would provide additional levels of protection for special status species as compared to Alternative A. The CSU stipulations could reduce soil erosion and runoff into nearby riparian areas, leading to less sedimentation of spawning habitat, and could maintain or improve water quality for special status species. Impacts to special status wildlife from TL stipulations would be the same as those described under Alternative A.

Applying an NSO stipulation for mineral leasing would prevent surface-disturbing activities from mineral development within 452,269 acres, 318,695 more acres as compared to Alternative A. Impacts to habitat for special status species would be similar to Alternative A; however, a much larger area of land would be protected from surface-disturbing activities from mineral development. The NSO stipulation would protect larger areas of habitat for Mexican spotted owl (278,146 acres), burrowing owl (145,014 acres) and bald eagle (64,497 acres) than Alternative A (Table 4-50). As in Alternative A, Jones cycladenia is managed with an NSO stipulation. Vegetation types that provide habitat for special status wildlife species would have larger areas of protection under the NSO stipulation: 82,334 more acres of blackbrush habitat, 138,265 more acres of pinyon-juniper, and 46,574 more acres of salt desert shrub would be protected compared to Alternative A. Special status species such as short-eared owl, ferruginous hawk, kit fox, fringed myotis,

and Stage-station milkvetch (*Astragalus sabulous* var. *vehiculus*) may occupy these three habitat types protected within lands managed with an NSO stipulation (UDWR 2005b).

Impacts to habitat for special status species from closing 753 acres to oil and gas leasing would be the same as described under Alternative A.

Potash leasing would only occur within the PLAs (103,619 acres), with 57,620 of these acres available for potash leasing with CSU and TL stipulations, and the remaining 45,999 acres are available with NSO stipulations. Table 4-52 shows the acres of habitat for special status species within the NSO and CSU stipulations. Overlap of habitat within the NSO is greatest for the Mexican spotted owl (21,235 acres) burrowing owl (9,608 acres) and bald eagle (13,200 acres) where land would be protected from surface disturbance from potash leases. Development could occur within the CSU acres, subject to the leasing stipulations within habitat for the burrowing owl (22,256 acres), bald eagle (13,983 acres), Mexican spotted owl (11,401 acres), and sensitive plant habitat (232 acres). Impacts to special status species habitat from potash leasing would be very similar to impacts from oil and gas leasing described above; however, the amount of land disturbed in potash leases is somewhat larger due to larger well pad footprints and additional infrastructure, 3.7 acres for oil and gas compared to 4.5 acres for potash.

Table 4-52. Special Status Species Habitat by Potash Leasing Stipulation within the Potash Leasing Areas for Alternatives B1 and D (only)

Leasing Stipulation	PLA Alternative B1 (acres)	PLA Alternative D (acres)
Mexican Spotted Owl Habitat (Threatened)		
CSU/TL	11,401	11,430
NSO	21,235	21,206
Southwestern Willow Flycatcher (Endangered) and Yellow-billed Cuckoo Habitat (Threatened)		
CSU/TL	16	28
NSO	1,072	1,060
Endangered Colorado River Fish Habitat		
CSU/TL	0	0
NSO	624	624
Gunnison Prairie Dog Habitat (BLM Special Status Species)		
CSU/TL	0	0
NSO	0	0
Ferruginous Hawk Habitat (BLM Special Status Species)		
CSU/TL	0	0
NSO	0	0
Burrowing Owl Habitat (BLM Special Status Species)		
CSU/TL	22,256	22,449
NSO	9,608	9,415
Bald Eagle Habitat (BLM Special Status Species)		
CSU/TL	13,983	13,983

Leasing Stipulation	PLA Alternative B1 (acres)	PLA Alternative D (acres)
NSO	13,200	13,200
Sensitive Plant Habitat		
CSU/TL	232	444
NSO	2,603	2,391

Under Alternative B1, approximately 681,948 acres are deferred for potash leasing and development as compared to Alternative A where 651,240 acres are available as open with standard terms and conditions (open) and with minor constraints (CSU and TL stipulations). Alternative B1 provides far less acreage (593,620 acres) managed as open and with minor constraints for potash leasing and development than Alternative A. The area deferred for potash leasing in Alternative B1 would prevent damage or loss of wildlife habitat from potash development outside of the PLAs, reduce disturbance to wildlife from the presence of humans, vehicles or machinery, reduce erosion or runoff, and support an intact ecosystem. Oil and gas development would still occur within those areas deferred for potash leasing, but there would be less density of disturbance from overlapping development and infrastructure. Reduction in surface disturbance could reduce soil loss, erosion, or sedimentation of streambeds, could support water quality, and provide protection of habitat for fisheries and other aquatic species.

Under Alternative B1, the TL stipulation for mineral leasing to prohibit surface-disturbing activities on saline soils would only apply within 49,915 acres. The TL stipulation would not apply within the PPFAs which could result in habitat damage or removal, erosion, and runoff of saline soils into nearby riparian areas, which could affect water quality and streambed conditions. However, an additional CSU stipulation within the PPFAs would require offsite mitigation of any disturbance of saline soils within these areas (18,360 acres) and sagebrush-steppe (8,075 acres). Offsite mitigation could eventually provide soil stability, reduced erosion, improve sagebrush-steppe habitat, and new seral stages of habitat where rehabilitation efforts are successful.

Minimizing impacts to sagebrush steppe in areas of moderately high to very high ecological intactness through the Baseline CSU stipulation could reduce damage or loss of sagebrush steppe habitat to a greater degree and with more consistency than Alternative A (11,269 acres). As part of the Baseline CSU stipulation, offsite mitigation could support new areas of sagebrush steppe habitat if regeneration were successful; however, restoration of this vegetation community can take between 10 to 50 years depending on climate, soil quality, and other factors. An additional CSU stipulation under Alternative B1 for PPFAs (8,075 acres of sagebrush) could offset some losses of sagebrush steppe habitat from development of processing facilities through additional offsite mitigation and could provide future sources of forage over the long-term if revegetation efforts are successful. Minimizing the loss of sagebrush steppe and mitigation efforts could continue to regenerate sagebrush steppe habitat for special status species such as Gunnison prairie dog, short-eared owl, ferruginous hawk and fringed myotis within the Planning Area as revegetation efforts are completed.

Impacts Specific to Alternative B2 Only

In Alternative B2, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would reduce impacts to special status species that would result from the concurrent development of oil and gas and potash as described in Alternative A. The impacts to special status species from the limited

potash development provided in Alternative B1 would be greater than the exclusion of potash development in Alterative B2.

Alternative B2 would substitute oil and gas well drilling for potash well drilling within the PLAs established in Alternative B1 and the impacts to special status species would be similar. The major difference between Alternative B1 and Alternative B2 is that Alternative B2 eliminates the 3,037 acres of surface disturbance, and the associated potential adverse impacts to special status species, that could result from the construction of potash processing facilities within the 42,492 acres of PPFAs established in Alternative B1.

Managing the entire Planning Area as open only for oil and gas leasing (closed to potash leasing) would prevent damage or loss of special status species habitat from potash leasing and development and could reduce disturbance to special status wildlife from the presence of humans, vehicles or machinery, reduce erosion or runoff, and could help reduce habitat fragmentation from potash drilling operations, processing facilities, and associated infrastructure.

The reduction of habitat loss or disturbance could reduce displacement of special status wildlife, allow for more contiguous habitat for migration or movement corridors, and prevent openings in habitat where invasive, non-native species could establish, spread, and cause further losses of habitat and habitat function. Oil and gas development would still occur within these acres, but there would be less density of disturbance from overlapping oil and gas and potash development and infrastructure. Reduction in surface disturbance could reduce soil loss, erosion, or sedimentation of streambeds, and could support water quality and provide protection of habitat for special status fish and other special status species. Reduced surface disturbance could also protect special status plant species from removal or damage, soil loss and erosion, and the increased risk of habitat loss from the introduction or spread of invasive, non-native plant species.

Under Alternative B2, there are zero acres managed as open to oil and gas leasing with standard terms and conditions as compared to 210,884 in Alternative A. Therefore, Alternative B2 could result in less damage or removal of special status wildlife habitat as compared to Alternative A.

CSU and TL stipulations to oil and gas leasing would have the same impacts to special status species as those described in Alternative B1.

Applying an NSO stipulation for oil and gas leasing would prevent surface development within 499,008 acres, 365,434 more acres as compared to Alternative A and a similar amount of acreage as compared to Alternative B1. Impacts to special status species habitat would be the same as those described under Alternative B1, and less than those described under Alternative A.

Impacts to special status species from closing 753 acres to oil and gas leasing would be the same as described under Alternative A.

Impacts to habitat for special status species from applying a TL stipulation to saline soils would be the same as those described in Alternative A.

Minimizing impacts to sagebrush steppe through a CSU stipulation could reduce loss of sagebrush steppe vegetation to a greater degree than Alternative A. Impacts to habitat for special status species would be the same as described under Alternative B1.

4.17.5 Impacts from Alternative C

In Alternative C, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would result in the same impacts to special status species as those described in Alternative B2.

Closing the existing Three Rivers mineral withdrawal (23,441 acres) and suitable WSR segments along the Colorado and Green Rivers to mineral leasing (19,347 acres) could provide greater protection to special status fish and riparian species compared to Alternatives A and B. The closure would provide greater protection to special status species because it could limit development from adjacent lands. The closure would protect riparian and upland vegetation, reduce sedimentation and siltation of streambeds and spawning habitat, protect fisheries, and support water quality. Habitat for endangered Colorado River fish (14,654 acres) would be protected from degradation, channel alteration, and changes in streamflow velocity. Wildlife that use riparian, upland, and wetland habitat such as Western yellow-billed cuckoo, bald eagle, and Southwestern willow flycatcher, would benefit from the undisturbed habitat, forage, and the reduced presence of humans and machinery associated with mineral leasing.

Impacts to habitat for special status species from maximizing oil and gas lease size and thus reducing or eliminating redundant infrastructure from oil and gas development would be the same as those described in Alternative B.

Applying the Baseline CSU stipulation for oil and gas leasing and development, could reduce surface disturbance when compared to Alternative A. Impacts to habitat for special status species would be similar to Alternatives B1 and B2.

Under Alternative C, as in Alternatives B1 and B2, there are zero acres managed as open to oil and gas and potash leasing with standard terms and conditions as compared with the 210,884 acres in Alternative A. Therefore, Alternative C could result in less damage or removal of special status wildlife habitat as compared to Alternative A.

Alternative C applies CSU and TL stipulations to oil and gas leasing on 54,799 acres, which is much less acreage than Alternatives A and B. While Alternative C has fewer acres that are managed with a CSU or TL stipulation, these acres are managed more restrictively (NSO and closed). Thus, Alternative C provides more protection to special status species than do Alternatives A and B.

Applying an NSO stipulation in Alternative C to oil and gas leasing would prevent surface-disturbing activities from oil and gas development on 550,599 acres, which is 412,496 more acres as compared to Alternative A, and 51,511 acres more than Alternatives B1 and B2. Impacts would be similar to those described under Alternatives A, B1, and B2, but would apply to a much larger area, allowing for greater habitat connectivity for species breeding, nesting, and migration; reductions in disturbance from human presence, mineral development activities, and vehicles; and overall protection of sensitive habitat for special status species. In Alternative C, pinyon-juniper would receive the largest area of protection from the NSO stipulation (223,391 acres, Table 4-55), which provides habitat for species, such as ferruginous hawk, Townsend's big-eared bat, and fringed myotis (UDWR 2005b). Blackbrush would also receive greater protection than Alternative A (98,003 more acres, 133,438 total acres) providing species such as Great Plains toad and kit fox with greater continuity of habitat, reduced conflicts with vehicles and humans, and less damage or disturbance of habitat from mineral leasing activities (U.S. Forest Service [USFS] 2013). The largest areas of habitat for special status species protected under this alternative are 252,101 acres of Mexican spotted owl habitat, 203,238 acres of burrowing owl habitat, and 98,363 acres of bald eagle habitat (Table 4-50).

Under Alternative C, closing 180,169 acres to oil and gas leasing and development would preclude surface disturbance on 179,416 more acres than Alternatives A, B1, and B2. Impacts to special status species would be similar to those described under Alternative A, but would apply to far more acres of special status species habitat.

The largest plant communities that provide habitat to special status species that are closed in Alternative C include pinyon-juniper (77,728 acres, which is 77,200 acres more than Alternative A) and blackbrush (53,109 acres, which is 53,067 acres more than Alternative A), which would provide undisturbed habitat for nearly every special status species listed in Table 4-50. Under Alternative C, 112,819 acres of Mexican spotted owl habitat, 60,749 acres of burrowing owl habitat, and 19,230 acres of sensitive plant habitat are closed to oil and gas leasing and development. All Jones cycladenia is managed as closed to mineral leasing in Alternative C, thereby providing greater protection than found in Alternatives A and B.

Impacts to habitat for special status species from applying a TL stipulation to saline soils would be the same as those described in Alternatives A and B.

Impacts to habitat for special status species from applying a CSU stipulation for offsite reclamation for areas of saline soils would be the same as those described in Alternative B. There is no requirement for offsite reclamation in Alternative A.

Applying a CSU stipulation on slopes between 21 percent and 30 percent and avoiding development, where possible, could reduce or prevent surface disturbance to special status species habitat, protect vegetation and soils from damage or loss, and could prevent or reduce erosion. The stipulations could minimize damage or loss of hillside and downslope habitat and could prevent landslides and heavy erosion on slopes thereby reducing larger losses of habitat (46,525 acres). Erosion control plans could reduce vegetation damage or loss, soil loss, and runoff in areas where development occurs. Applying an NSO to slopes more than 30 percent would provide direct protection of special status species habitat from damage or removal in areas with potential for heavy runoff and erosion when disturbed (134,594 acres). Mexican spotted owl, big-eared bat, and Canyonlands lomatium habitat could be protected by the NSO and CSU stipulations, which could minimize or prevent disturbance to soils, forage, cover, and travel corridors. Preventing or reducing erosion, soil loss and runoff would reduce sedimentation of spawning gravel, and would protect in-stream habitat for special status fish from reduced water quality and channel degradation. These stipulations provide more protection for special status species habitat located along steep slopes than is provided in Alternatives A and B because Alternative C provides an NSO stipulation to slopes greater than 30 percent.

Applying an NSO stipulation to preclude mineral activities within public water reserves, 100-year floodplains and within 650 feet of intermittent and perennial streams, rivers, riparian areas, wetlands, water wells, lakes, and springs (91,558 acres) provides the greatest protection to special status species habitat as compared to Alternative A, with larger buffer distances (330 feet larger) and additional riparian areas (41,063 more acres). Impacts to special status species habitat would be similar to those described in Alternative A; however, the larger area of protection would support endangered Colorado River fishes and allow for greater protection of aquatic, riparian, wetland, and upland habitat. The management would provide greater access to water sources for wildlife, reduce disturbance or disruption of special status wildlife from mineral development, and provide access to uninterrupted, contiguous habitat for wildlife movement or migration. Applying an NSO stipulation to preclude mineral activities within 1,000 feet of the Colorado River and Fisher Creek (6,883 acres) would allow for additional protection of wetland and riparian habitat within or adjacent to these areas, and provide greater protection of habitat for special status fish. Applied here, the stipulation allows for 2,293 more acres as compared to Alternative B.

Applying an NSO stipulation to important spring areas (38,056 acres) including the Courthouse Wash Watershed (51,790 acres) and Salt Wash Watershed (61,925 acres) would protect water quality in adjacent aquifers and watersheds from contaminants or diminished water quality resulting from mineral development activities. This management would protect habitat for fish and other aquatic species, prevent degradation of riparian and wetland habitat, and provide clean water sources for wildlife use. Special status wildlife that use riparian and wetland habitat such as the bald eagle, Southwestern willow flycatcher, yellow-billed cuckoo, and Western red bat, would benefit from the additional protection of water resources. Alternative C with its NSO stipulations provides greater protection than the CSU stipulation provided in Alternative B. Alternative A does not specifically address important spring areas and the Courthouse and Salt Wash Watersheds.

Impacts to habitat for special status species from minimizing impacts to sagebrush steppe through the Baseline CSU stipulation and BMPs would be similar to Alternative B (11,269 acres), but the CSU would apply to all ecological conditions of sagebrush steppe habitat, protecting a much larger area of sagebrush steppe habitat for special status species (68,272 acres). This management would provide the greatest protection to sagebrush-obligate special status species such as Gunnison prairie dog, kit fox, and ferruginous hawk (UDWR 2005b). Alternative A does not specifically address sagebrush steppe habitat.

Impacts to habitat for special status species by applying BMPs for oil and gas leasing and development would be the same as those described in Alternative B.

Impacts to special status species from conducting surveys to avoid special status plants would be the same as those described in Alternative B.

Under Alternative C, a CSU stipulation to restrict noise would be applied to mineral operations. This management could reduce disturbance of special status wildlife and prevent disruption to species during sensitive timeframes. Wildlife can become stressed and will flee or abandon habitat when noise reaches certain levels, with the level of noise sensitivity varying among wildlife species. Preventing or reducing disturbance to special status wildlife would allow species to remain in high quality habitat with access to preferred cover and forage, which could reduce stress, and support reproductive success. A lease stipulation to address noise is not applied in Alternatives A or B. Therefore, Alternative C reduces impacts to special status species from noise generated from oil and gas operations as compared to Alternatives A and B.

4.17.6 Impacts from Alternative D

Impacts to habitat for special status species from applying an NSO for the Three Rivers mineral withdrawal would be the same as Alternatives A and B.

Impacts to habitat for special status species from maximizing lease size and thus reducing or eliminating redundant infrastructure from oil and gas development would be the same as those described in Alternatives B and C.

Impacts to habitat for special status species from not issuing oil and gas leases within PLAs (103,619 acres) would be the same those described in Alternative B1.

Impacts to habitat for special status species from applying a CSU stipulation to all potash leases that requires processing facilities to be located within a PPFA (42,492 acres) would be similar to Alternative B1; however, an exception could allow for a small-scale potash processing facility within the PLAs, allowing an additional disturbance of up to 100 acres. If the smaller potash processing facility were to be developed, damage, degradation, or removal of habitat for special status species would occur within the 100 acres, along with fragmentation of habitat. Disturbance from humans, construction activities, or vehicle traffic

could occur during construction and operation of the facilities. Direct habitat loss or degradation of habitat could force special status raptors or other wildlife to relocate to other areas where competition for forage and other habitat resources could increase. Increased competition for resources could lead to decreased health and reproduction and could result in increased predation or mortality. Invasive, non-native plant species could be introduced and spread by vehicles and machinery during operation of the facilities, which could change vegetation composition and function, making habitat inhospitable for native plant species and could lead to further losses of habitat. Additionally, erosion or runoff could damage or degrade habitat for special status fish and other aquatic or riparian species.

Table 4-53 shows the acres of special status species habitat by potash leasing stipulation within the proposed PPFAs. Impacts to special status species would be nearly the same as described in Alternative B1. There are only very minimal differences for the number of acres of habitat protected by an NSO stipulation for ephemeral drainages as well as the number of acres within CSU/TL stipulations for Alternatives B1 and D.

Table 4-53. Special Status Species Habitat within the Potash Processing Facility Areas by Potash Leasing Stipulation for Alternatives B1 and D (only)

Leasing Stipulation	PPFA Alternative B1 (acres)	PPFA Alternative D (acres)
Mexican Spotted Owl Habitat (Threatened)		
CSU/TL	889	889
NSO	104	104
Southwestern Willow Flycatcher (Endangered) and Yellow-billed Cuckoo Habitat (Threatened)		
CSU/TL	17	17
NSO	10	10
Endangered Colorado River Fish Habitat		
CSU/TL	0	0
NSO	0	0
Gunnison Prairie Dog Habitat (BLM Special Status Species)		
CSU/TL	2,766	2,766
NSO	112	112
Ferruginous Hawk Habitat (BLM Special Status Species)		
CSU/TL	2,158	2,158
NSO	171	171
Burrowing Owl Habitat (BLM Special Status Species)		
CSU/TL	25,428	25,423
NSO	1,687	1,693
Bald Eagle Habitat (BLM Special Status Species)		
CSU/TL	2,502	2,502
NSO	190	190
Sensitive Plant Habitat		
CSU/TL	936	936

Leasing Stipulation	PPFA Alternative B1 (acres)	PPFA Alternative D (acres)
NSO	47	47

Applying the Baseline CSU stipulation in Alternative D for all mineral development on 213,218 acres (these acres are included in the total acres of CSU stipulations), could reduce surface disturbance when compared to Alternative A, which primarily consists of timing limitations. Impacts to habitat for special status species from the Baseline CSU stipulation would be the same as described under Alternative B, but would apply to slightly more acres in Alternative D (5,033 more acres).

Alternative D provides exceptions to some of the mineral stipulations, including an NSO stipulation to protect visual resources, the Baseline CSU stipulation, and the CSU stipulation for potash leases that would allow small-scale potash processing facilities within PLAs. These exceptions could result in additional development activity, surface disturbance, and habitat loss, along with additional habitat fragmentation, additional erosion, sedimentation of spawning habitat, degradation of special status fish and riparian species habitat.

Under Alternative D, as in Alternatives B1, B2, and C there are zero acres managed as open to oil and gas and potash leasing with standard terms and conditions as compared with the 210,884 acres in Alternative A. Therefore, Alternative D could result in the less damage or removal of special status wildlife habitat as compared to Alternatives A.

Applying CSU and TL stipulations in Alternative D to oil and gas leasing on 230,675 acres would result in similar impacts to special status species as those described in Alternatives B1 and B2. While Alternative D has 209,781 fewer acres than Alternative A that are managed with a CSU or TL stipulation, all of these acres are managed more restrictively (NSO and closed) in Alternative D. Thus, Alternative D provides more protection to special status species than does Alternative A. While Alternative D has 175,966 more acres than Alternative C that are managed with a CSU or TL stipulation, the majority of these acres are managed more restrictively in Alternative C. Thus, Alternative C provides more protection to special status species than does Alternative D.

Applying an NSO stipulation in Alternative D to oil and gas leasing would prevent surface-disturbing activities from oil and gas development on 305,899 acres, which is 172,325 more acres as compared to Alternative A, but 245,700 acres fewer than Alternative C. While Alternatives B1 and B2 manage 146,390 more acres with an NSO stipulation as opposed to Alternative D, the majority of these 146,390 acres are managed as closed in Alternative D. Thus, Alternative D provides more protection to special status species than do Alternatives A, B1, and B2, but less protection in Alternative C. The largest areas of habitat protected are pinyon-juniper (146,998 acres), blackbrush (72,306 acres), and a much larger area of sagebrush (23,183 acres), which are protected in Alternative D (21,887 more acres than Alternative A). Habitat for species such as ferruginous hawk, Townsend's big-eared bat, fringed myotis, Mexican spotted owl, and Gunnison prairie dog would be protected in Alternative D within the areas managed with an NSO stipulation (UDWR 2005b). Larger areas of habitat for sensitive plants (25,520 acres), bald eagle (51,465 acres), and burrowing owl (88,674 acres) are protected compared to Alternative A (Table 4-50).

Closing 145,284 acres to oil and gas leasing in Alternative D, 144,531 more acres than Alternatives A and B, would prevent damage or loss of habitat for special status species from development activities, would retain stable soil resources, prevent erosion or runoff, and protect an intact ecosystem. Impacts to habitat for special status species would be similar to Alternatives A and B, but would cover a much larger area.

Under Alternative D, the largest areas of habitat protected within the closed areas would be blackbrush (45,605 acres) and pinyon-juniper (60,255 acres) which contain habitat ferruginous hawk, Townsend's big-eared bat, Paradox breadroot, fringed myotis, Trotter's oreoxis, and Mexican spotted owl (UDWR 2005b). All Jones cycladenia is managed as closed to mineral leasing in Alternative D, thereby providing greater protection than found in Alternatives A and B, and the same protection as provided in Alternative C. Habitat for special status species would be protected within the closed areas where it was not under Alternative A for ferruginous hawk (294 acres), and sensitive plants (18,886 acres) plus 55,388 acres more for the burrowing owl (compared to 22 acres in Alternative A). The acreage closed in Alternative D is 34,885 fewer acres than Alternative C. Therefore, Alternative C provides the most protection to special status species.

In Alternative D, potash leasing would only be permitted within the PLAs (103,619 acres), with 57,308 of these acres available for potash leasing with CSU and TL stipulations, and the remaining 45,311 acres available with NSO stipulations. Impacts to habitat for special status species from well drilling would be very similar to those impacts from oil and gas. Impacts to habitat for special status species from potash leasing would be similar to those described under Alternative B1, but with only slight changes in acres protected by lease stipulations. Special status species habitat protected under the NSO and CSU stipulations for potash leasing is very similar between Alternatives B1 and D with the only minor differences between the alternatives (Table 4-54).

Table 4-54. Special Status Species Habitat within the Potash Leasing Areas by Potash Leasing Stipulation for Alternatives B1 and D (only)

Leasing Stipulation	PLA Alternative B1 (acres)	PLA Alternative D (acres)
Mexican Spotted Owl Habitat (Threatened)		
CSU	11,401	11,430
NSO	21,235	21,206
Southwestern Willow Flycatcher (Endangered) and Yellow-billed Cuckoo Habitat (Threatened)		
CSU	16	28
NSO	1,072	1,060
Endangered Colorado River Fish Habitat		
CSU	0	0
NSO	624	624
Gunnison Prairie Dog Habitat (BLM Special Status Species)		
CSU	0	0
NSO	0	0
Ferruginous Hawk Habitat (BLM Special Status Species)		
CSU	0	0
NSO	0	0
Burrowing Owl Habitat (BLM Special Status Species)		
CSU	22,256	22,449
NSO	9,608	9,415

Leasing Stipulation	PLA Alternative B1 (acres)	PLA Alternative D (acres)
Bald Eagle Habitat (BLM Special Status Species)		
CSU	13,983	13,983
NSO	13,200	13,200
Sensitive Plant Habitat		
CSU	232	444
NSO	2,603	2,391

Applying a CSU stipulation to all potash leases that requires processing facilities to be located within a PPFA would have the same impacts to special status species as those described in Alternative B1. Alternatives B2 and C do not provide for potash leasing. As a result, there would be no impacts to special status species from establishing PPFAs.

Impacts to habitat for special status species from closing approximately 681,948 acres to potash leasing are the same as those described in Alternative B1. However, Alternatives B2 and C close the entire Planning Area to potash leasing and development and therefore provide the greatest protection to special status species.

Impacts to habitat for special status species by applying a TL stipulation to saline soils within would be the same as those described under Alternative B1.

Impacts to habitat for special status species from applying a CSU stipulation for offsite reclamation for areas of saline soils would be the same as those described in Alternative B.

Impacts to habitat for special status species from applying a CSU stipulation for slopes greater than 21 percent would be the same as those described in Alternative B.

Impacts to habitat for special status species from applying an NSO stipulation to preclude mineral activities within public water reserves, 100-year floodplains and within 500 feet of intermittent and perennial streams, rivers, riparian areas, wetlands, water wells, lakes, and springs (69,786 acres, and applying an NSO stipulation to preclude mineral activities within 750 feet of the Colorado River and Fisher Creek (4,590 acres) would be the same as those described under Alternative B. Additionally, the impacts would be more than those described in Alternative C.

Impacts to habitat for special status species from applying an NSO stipulation to the suitable WSR segments along the Colorado and Green Rivers would be the same as those described in Alternatives A and B, but more than those described in Alternative C.

Impacts to habitat for special status species from minimizing impacts to sagebrush steppe through the Baseline CSU stipulation would be the same as those described in Alternatives B1, B2, and C. In addition, applying a CSU stipulation requiring compensatory mitigation outside the area of impact in sagebrush-steppe habitat within PPFAs would have the same impacts to special status species as those described in Alternative B1.

Impacts to habitat for special status species from applying BMPs for mineral leasing and development and from conducting surveys to avoid special status plants would be the same as those described in Alternative B.

Impacts to habitat for special status species from applying a CSU stipulation for noise mitigation would be the same as those described in Alternative C.

4.18 VEGETATION

This section presents potential impacts to vegetation resources from implementing management actions presented in Chapter 2. Existing conditions concerning vegetation resources are described in Chapter 3.

4.18.1 Assumptions

- Adequate vegetative ground cover and species composition for site stabilization typically would occur within 10 to 15 years in shrub communities and 15 to 20 years in desert communities.
- Re-establishment of slow growing vegetation, such as trees and shrubs, in disturbed areas would create a vegetative landscape similar to adjacent undisturbed lands in excess of 100 years.
- All plant communities would be managed toward achieving a mix of species composition, cover, and age classes across the landscape.
- The degree of impact attributed to any one disturbance or series of disturbances would be influenced by several factors, including location; the type, time, and degree of disturbance; existing vegetation, precipitation, and mitigating actions applied to the disturbance.
- Noxious and invasive weeds would continue to be introduced and spread as a result of ongoing vehicle traffic in and out of the Planning Area, recreational activities, wildlife and livestock grazing and movements, and surface-disturbing activities.

4.18.2 Impacts Common to All Alternatives

The following discussions represent impacts on vegetation resources that would not vary by alternative.

Management to support air quality and the use of dust abatement measures could support vegetation resources by preventing dust accumulation on foliage and reducing airborne pollutants or particulate matter that could damage vegetation.

BMPs for water quality could support the health of upland and riparian vegetation resources through continued availability of water resources and could protect water quality, further supporting riparian vegetation resources.

Management to protect special status species, wildlife, and associated habitat would protect vegetation from surface-disturbing activities either seasonally or throughout the year. Any reduction or prevention of surface disturbance would protect would prevent damage or loss of vegetation, and reduce soil loss and erosion.

4.18.3 Impacts from Alternative A (No Action)

Under Alternative A, oil and gas and potash leasing and development could occur concurrently within the same tract of land, which could result in higher concentrations of development and redundant infrastructure. Although drilling for oil and gas and potash is similar, the production of potash requires the use of potash processing facilities, which involve large tracts of land over a long period of time. Any area where oil and gas and potash leasing and development occurs would cause surface disturbance resulting in both short-term and long-term vegetation loss and the increased potential for the introduction and spread of invasive, non-native plant species.

In Alternative A, allowing oil and gas leasing and development subject to standard lease terms and conditions would result in the damage or removal of vegetation and damage or loss of soil resources from the development of well pads and associated infrastructure within the 210,884 acres of open to leasing with standard terms and conditions (open). Invasive, non-native plant species could be introduced and spread by vehicles and machinery during development activities, which could change habitat composition and function, making habitat inhospitable for native plant species and could lead to further losses of native vegetation.

Approximately 476 acres of vegetation and topsoil could initially be removed for lease development in the next 15 years, which would result in direct loss of vegetation resources, soil erosion. Disturbed areas would be vulnerable to the introduction and spread of noxious weeds, leading to additional loss of native vegetation resources. Over the long-term, reclamation would occur and vegetation would re-establish within 133 acres, leaving 343 acres of net surface disturbance of vegetation. Reclaimed areas could provide new areas of native vegetation resources as revegetation efforts are completed.

Applying CSU and TL stipulations in Alternative A to oil and gas leasing could reduce damage or loss of vegetation resources within 440,386 acres. The TL stipulations would prevent surface disturbance during specific timeframes, which could support vegetation growth during the periods of closure; however, disturbance and vegetation removal could still occur outside of the seasonal closures, ultimately leading to some loss of vegetation from oil and gas development. The CSU stipulations could reduce disturbance to steep slopes, scenic driving corridors, and VRM Class II areas, minimizing surface disturbance, vegetation damage or removal, soil loss, erosion and the introduction and spread of invasive, non-native plant species.

In Alternative A, applying an NSO stipulation for oil and gas leasing would prevent surface-disturbing activities from oil and gas development within the 133,574 acres. The NSO stipulation could protect vegetation resources from damage or removal, prevent soil loss, and reduce erosion. The prevention of surface disturbance would reduce the potential for the introduction and spread of invasive, non-native plant species, supporting the native vegetation communities and ecosystems.

Closing 753 acres to oil and gas leasing in Alternative A would prevent damage or loss of vegetation resources from development activities, retain stable soil resources, prevent erosion or runoff, and protect an intact ecosystem. Precluding oil and gas development would prevent the introduction and spread of invasive, non-native plant species from machinery and vehicles, further supporting native vegetation communities and ecosystems.

Table 4-55 shows the acres of vegetation cover type that occur within the Planning Area within the areas that are open and closed for oil and gas leasing, as well as the acres of vegetation types that occur within the stipulated areas as NSO, CSU, and TL.

Table 4-55. Vegetation Cover Types by Mineral Leasing Category in Alternative A

Vegetation Cover Type	Mineral Leasing Category			
	Open (acres)	CSU and TL (acres)	NSO (acres)	Closed (acres)
Unclassified	413	1,299	1,145	35
Blackbrush	76,635	75,598	35,435	42
Disturbed Areas	20	1,975	0	0
Douglas Fir / Mixed Conifer	8	13	0	0
Dunes	14,865	6,018	2,142	0

Vegetation Cover Type	Mineral Leasing Category			
	Open (acres)	CSU and TL (acres)	NSO (acres)	Closed (acres)
Grasslands	7,499	15,405	2,892	7
Invasives	2,284	5,271	3,441	136
Mountain Shrub	63	169	0	0
Pinyon-Juniper	64,731	184,224	68,485	528
Ponderosa Pine	21	10	0	0
Riparian / Wetlands	358	1,377	201	0
Sagebrush	6,174	60,552	1,296	0
Salt Desert Shrub	36,967	86,582	15,451	214

In Alternative A, approximately 1,223 acres of vegetation could be removed for potash well drilling (production and non-production wells) in the next 15 years, which would result in direct loss of vegetation resources and topsoil, and could lead to the introduction and spread of invasive, non-native plant species. Over the long-term, reclamation would occur and vegetation resources could re-establish within 408 acres, leaving only 815 acres of net surface disturbance of vegetation resources.

Under Alternative A, impacts from the exploration and development of potash leases would be the same as described for the areas managed for oil and gas leasing as open with standard terms and conditions, the application of lease stipulations of CSU, TL, and NSO, and closing lands to mineral development.

Management for potash processing could allow processing facilities to be developed where existing stipulations do not preclude surface disturbance (NSO and closed). This means that potash processing facilities could be constructed in the 210,884 acres of open to leasing with standards terms and conditions (open) or possibly within the 440,386 acres of lands with CSU and TL stipulations. Development of processing facilities could permanently remove up to 3,716 acres for solar evaporation processing or 500 acres for crystallization processing; the loss of vegetation resources would continue through the life of the Moab MLP. Invasive, non-native plant species could be introduced and spread by vehicles and machinery during operation of the facilities, which could change vegetation composition and function, making habitat inhospitable for native plant species and could lead to further losses of native vegetation.

Applying a TL stipulation for mineral leasing (for both oil and gas and potash) prohibiting surface-disturbing activities on saline soils within 68,275 acres from December 1 to May 31 could seasonally reduce vegetation damage or removal, reduce soil loss and erosion, and prevent saline runoff, which could damage sensitive vegetation resources.

Management for salinity control, sensitive soils, drought management, and applying BMPs to all oil and gas authorizations in accordance to WO IM 2007-021 and the most current version of the *Gold Book* (could provide protection to vegetation resources and topsoil, reduce erosion and soil loss, prevent the establishment or spread of invasive, non-native plant species, and support reclamation and revegetation efforts. The BMPs could protect vegetation resources during oil and gas development, would provide guidelines for reclamation, and allow for continued native vegetation communities to establish in the Planning Area.

Applying mineral leasing stipulations for steep slopes (Table 4-56) could reduce or prevent surface disturbance, protect vegetation and soils from damage or loss, and could prevent or reduce erosion. The stipulations would directly protect or minimize damage or loss of hillside and downslope vegetation and could prevent landslides and heavy erosion on slopes that could result in larger losses of vegetation resources. Additional erosion control plans could reduce vegetation damage or loss, soil loss, and runoff in areas where development occurs.

Table 4-56. Mineral Leasing Stipulations on Steep Slopes by Alternative

Leasing Stipulation	Alternative A		Alternative B		Alternative C		Alternative D	
	Slope %	Acres	Slope %	Acres	Slope %	Acres	Slope %	Acres
CSU	Moab >30%	79,045	>21 %	181,119	21-30%	46,525	>21 %	181,119
	Monticello 21-40%	29,150						
NSO	Monticello >40%	42,339	-	-	>30%	134,594	-	-
Total Acres	**150,534 acres**		**181,119**		**181,119**		**181,119**	

Applying an NSO stipulation within public water reserves, 100-year floodplains, within 330 feet of riparian areas and springs (50,495 acres), would prevent surface disturbance and loss of riparian, wetland or upland vegetation from mineral development, and reduce the risk of erosion and runoff into riparian and wetland habitat. Reducing runoff and erosion would protect riparian and other vegetation from damage or further soil loss and could reduce the potential for the introduction and spread of invasive, non-native plant species, providing additional protection to downstream vegetation.

Avoiding or minimizing loss of sagebrush steppe habitat could help ensure contiguous and diverse vegetation communities within the Planning Area and specifically protect the sagebrush steppe vegetation resources where this management occurs.

The use of native seed mixes for restoration and rehabilitation would support the growth of native vegetation communities when areas have been rehabilitated. Use of non-native species could help stabilize soils and prevent erosion in the short-term, and over the long-term could provide stable land for native species to then re-establish. Preventing the infestation and spread of noxious weeds or controlling noxious weed species would support the health and vitality of native ecosystems and help to reduce competition with native species for soil, water, and solar resources, which would allow native plant species to thrive and provide intact habitat for wildlife.

4.18.4 Impacts from Alternative B

Under Alternative B, maximizing oil and gas lease size and applying the Baseline CSU stipulation to sensitive resources would result in reducing or eliminating redundant infrastructure from oil and gas development. This could reduce the amount of vegetation removed or disturbed by development activities, allowing for more contiguous vegetation communities. Reducing surface disturbance would reduce the potential for the introduction and spread of invasive, non-native plant species, supporting the native vegetation communities and ecosystems.

Applying the Baseline CSU stipulation for all mineral development, 208,185 acres in Alternative B1 and 222,289 acres in Alternative B2, could reduce surface disturbance when compared to Alternative A, which

primarily consists of timing restrictions. The Baseline CSU stipulation could minimize density of disturbance, reduce conflicts of development, and support reclamation and mitigation activities when development does occur. The Baseline CSU stipulation could reduce or minimize surface disturbance, reduce removal of vegetation and soil resources, and could provide reclamation or offsite mitigation of habitat. The reduction of disturbance could reduce further soil loss and erosion, allow for more contiguous vegetation resources, and prevent openings in habitat where invasive, non-native species could establish and spread.

Applying BMPs in Alternative B, as appropriate, to mineral operations (oil and gas and potash) could provide greater protection to vegetation resources, including sagebrush steppe and blackbrush, prevent the establishment or spread of invasive, non-native plant species, and protect sensitive soils and other soil resources as compared to Alternative A. The BMPs include reclamation and restoration requirements and could allow for regeneration of native vegetation communities as development activities are completed, which would support overall ecosystem health and provide a variety of seral stages of vegetation.

In Alternative B, applying a CSU stipulation to mineral leasing for offsite reclamation for areas of saline soils could provide soil stability and help reduce vegetation loss, soil erosion, and runoff if reclamation efforts were successful. Applying a CSU stipulation for steep slopes greater than 21 percent (Table 4-56) could directly protect or minimize damage or loss of hillside and downslope vegetation and could prevent landslides and heavy erosion on slopes that could ultimately result in larger losses of vegetation resources to a greater degree as compared to Alternative A (181,119 acres). Erosion control plans could reduce vegetation damage or loss, soil loss, and runoff in areas where development occurs.

Applying an NSO stipulation in Alternative B to preclude mineral activities within public water reserves, 100-year floodplains and within 500 feet of intermittent and perennial streams, rivers, riparian areas, wetlands, water wells, lakes, and springs (69,786 acres) provides greater protection for vegetation resources as compared to Alternative A with larger buffer distances (170 feet larger) and additional riparian areas (19,291 more acres). The larger area of protection would allow for contiguous native vegetation resources and would allow for fewer disturbances where invasive, non-native plant species could establish and spread.

Impacts Specific to Alternative B1 Only

Not issuing new oil and gas leases within Potash Leasing Areas PLAs (103,619 acres) could help to minimize adverse impacts to vegetation. These adverse impacts could result from concurrent oil and gas development and potash development, including potash processing facilities that could occur under Alternative A. However, 43 percent of the Hatch Point PLA contains existing oil and gas leases. Therefore, there is potential for concurrent development of oil and gas and potash on these existing leases and a greater likelihood for adverse impacts to vegetation. Allowing potash leasing and development within PLAs on 103,619 acres could result in impacts to vegetation that may be found in these areas from surface-disturbing potash related activities. If the acreage encompassed by PLAs were to become available solely for oil and gas leasing and development, the adverse impacts to visual resources would be similar to or less than the impacts identified for potash leasing and development. Alternative B1 does not allow potash leasing on 681,948 acres within the Planning Area, which would minimize adverse impacts to vegetation from concurrent oil and gas and potash development as compared to Alternative A.

A phased approach to potash leasing could help reduce impacts to vegetation as compared to Alternative A. By testing the feasibility of potash development, unnecessary surface disturbance would be avoided and appropriate mitigation measures applied. These measures would benefit vegetation.

Applying a CSU stipulation to all potash leases that requires processing facilities to be located within a PPFA within 42,492 acres would localize the disturbance and infrastructure to the PPFAs and prevent large-

scale disturbance from potash processing in other areas in the Planning Area. In Alternative A, potash processing facilities, amounting to 4,216 acres of surface disturbance, could occur anywhere within 210,884 acres of open areas and possibly 440,386 acres of lands with CSU and TL stipulations. Limiting the area available for PPFAs in Alternative B1 would reduce vegetation loss by preventing the location of facilities outside of the PPFAs in more sensitive vegetation resources and would reduce the amount of surface disturbance (from 4,216 acres to 3,037 acres) associated with processing facilities as compared to Alternative A. Table 4-57 shows the types of vegetation within the proposed PPFAs. NSO stipulations for ephemeral drainages within the PPFAs would protect 2,528 acres of vegetation from damage or removal. CSU/TL stipulation areas would allow for controlled development, with the greatest possible losses of vegetation types being salt desert shrub (21,566 acres) and sagebrush (8,075 acres).

Table 4-57. Vegetation Cover Type within Potash Processing Facility Areas for Alternative B1 by Leasing Stipulation

Vegetation Cover Type	Leasing Stipulation	
	CSU/TL (acres)	NSO (acres)
Unclassified	26	1
Blackbrush	4,454	184
Dunes	1,150	97
Grasslands	492	15
Invasives	92	18
Pinyon-Juniper	4,107	239
Riparian / Wetlands	2	1
Sagebrush	8,075	346
Salt Desert Shrub	21,586	1,627
Total	**39,984**	**2,528**

Under Alternative B1, there are zero acres managed as open to oil and gas and potash leasing with standard terms and conditions as compared with the 210,884 acres in Alternative A. Therefore, Alternative B1 could reduce or prevent surface-disturbing activities from oil and gas and potash development throughout these acres compared to Alternative A (Table 4-55 and Table 4-57).

In Alternative B1, approximately 312 acres of land could initially be removed for oil and gas development in the next 15 years, which would result in direct loss of vegetation resources, further soil erosion, and would the threat of introduction and spread of noxious weeds to disturbed areas, leading to additional loss of native vegetation resources. Over the long term, reclamation would occur and vegetation would re-establish within 87 acres, leaving only 225 acres of net vegetation loss from oil and gas operations (118 fewer acres than Alternative A). Reclaimed areas could provide new areas of vegetation resources as revegetation efforts are completed.

In Alternative B1, applying CSU and TL stipulations to oil and gas leasing could reduce damage or loss of vegetation resources within 228,926 acres. Applying CSU stipulations, which includes the Baseline CSU stipulation, could minimize density of disturbance, reduce conflicts of development, and support reclamation and mitigation activities when development does occur. The CSU stipulations could reduce or minimize surface disturbance, reduce removal of vegetation and soil resources, and could provide

revegetation in other areas if reclamation efforts are successful. The reduction of disturbance could reduce further soil loss and erosion, allow for more contiguous vegetation resources, and prevent openings in habitat where invasive, non-native species could establish and spread. Applying TL stipulations would prevent surface disturbance during specific timeframes, which could support vegetation growth during the periods of closure; however, disturbance and vegetation removal could still occur outside of the seasonal closures, ultimately leading to some loss of vegetation resources from oil and gas development. While Alternative B1 has 221,430 fewer acres than Alternative A that are managed with CSU and TL stipulations, these acres are managed more restrictively (NSO and closed) in Alternative B1. Thus, Alternative B1 provides more protection to vegetation than does Alternative A.

Applying an NSO stipulation for oil and gas leasing in Alternative B1 would prevent surface-disturbing activities from oil and gas development within 452,269 acres, 318,695 more acres as compared to Alternative A. NSO stipulations could protect vegetation resources from damage or removal, prevent soil loss, and reduce erosion. The prevention of surface disturbance would reduce the potential for the introduction and spread of invasive, non-native plant species, supporting the native vegetation communities and ecosystems.

Impacts to vegetation resources from closing 753 acres in Alternative B1 to oil and gas leasing would be the same as described under Alternative A.

Table 4-58 displays the difference in vegetation cover type by leasing stipulation in Alternative A compared to Alternative B1. As shown in the table, Alternative B1 includes fewer acres of CSU, however, Alternative B1 includes more acres of NSO as compared to Alternative A. Therefore, Alternative B1 protects more acreage of vegetation with an NSO stipulation than does Alternative A. Acreage closed in Alternatives A and B1 are identical.

Table 4-58. Vegetation Cover Type by Leasing Stipulation in Alternatives A and B1

Vegetation Cover Type	Alt. B1 CSU (acres)	Alt. A CSU (acres)	Alt. B1 NSO (acres)	Alt. A NSO (acres)	Alts. A and B1 Closed (acres)
Unclassified	1,171	1,299	1,630	1,145	35
Blackbrush	42,871	75,598	117,769	35,435	28
Disturbed Areas	528	1,975	1,474	0	0
Douglas Fir / Mixed Conifer	8	13	14	0	0
Dunes	4,712	6,018	10,805	2,142	0
Grasslands	7,620	15,405	13,740	2,892	6
Invasives	2,369	5,271	8,246	3,441	132
Mountain Shrub	35	169	202	0	0
Pinyon-Juniper	72,873	184,224	206,750	68,485	418
Ponderosa Pine	2	10	31	0	0
Riparian / Wetlands	23	1,377	1,899	201	0
Sagebrush	24,754	60,552	27,684	1,296	0
Salt Desert Shrub	71,961	86,582	62,025	15,451	134
Total	**228,927**	**-**	**542,269**	**-**	**753**

Potash leasing would only be permitted within the PLAs (103,619 acres), with 57,620 of these acres available for potash leasing with CSU and TL stipulations, and the remaining 45,999 acres available with NSO stipulations (Table 4-59). Impacts to vegetation resources from potash leasing and well drilling would be similar to impacts from oil and gas leasing and well drilling. Projected potash well drilling in Alternative A amounts to 1,223 acres of surface disturbance and projected potash well drilling in Alternative B1 amounts to 647 acres of surface disturbance. Therefore, the potential impacts to vegetation resources are less in Alternative B1 than in Alternative A.

Table 4-59. Vegetation Cover Types within the Potash Leasing Areas by Leasing Stipulation for Alternative B1

Vegetation Cover Type	CSU Stipulation (acres)	NSO Stipulation (acres)
Unclassified	45	69
Blackbrush	18,154	11,323
Dunes	5,627	2,114
Grasslands	3,905	839
Invasives	114	387
Pinyon-Juniper	20,401	24,058
Riparian / Wetlands	10	64
Sagebrush	7,166	9,675
Salt Desert Shrub	4,448	1,891

Under Alternative B1, approximately 681,948 acres are deferred for potash leasing and development as compared to Alternative A, where 651,240 acres are open with standard terms and conditions and with minor constraints (CSU and TL stipulations). Therefore, Alternative B1 provides far less acreage for potash development than Alternative A. Managing the area as deferred for potash leasing in Alternative B1 would prevent damage or loss of vegetation resources from leasing activities, retain stable soil resources, prevent erosion or runoff and protect an intact ecosystem. The removal of future potash leasing activities would also prevent the introduction and spread of invasive, non-native plant species from machinery and vehicles, further supporting native vegetation communities and ecosystems. Oil and gas development would still occur within those areas deferred for potash leasing, but there would be less density of disturbance from overlapping development and infrastructure.

Under Alternative B1, the TL stipulation for mineral leasing prohibiting surface-disturbing activities on saline soils would only apply within 49,915 acres as compared to 68,275 acres in Alternative A. The TL stipulation would not apply within the PPFAs in Alternative B1, which could result in vegetation loss, erosion, and runoff of saline soils into nearby riparian areas; however, an additional CSU stipulation with the PPFAs would require offsite mitigation of any disturbance of saline soils within these areas (18,360 acres) thus offsetting the impacts to vegetation on saline soils in the PPFAs. Mitigation could eventually provide soil stability and reduced erosion where rehabilitation efforts are successful.

Minimizing impacts to sagebrush steppe in areas of moderately high to very high ecological intactness through the Baseline CSU stipulation could reduce damage or loss of sagebrush steppe vegetation to a greater degree than Alternative A. As part of the Baseline CSU stipulation, offsite mitigation could support sagebrush steppe vegetation if regeneration were successful; however, revegetation for this vegetation

community can take 10 to 50 years depending on climate, habitat quality, and other factors. An additional CSU stipulation under Alternative B1 for PPFAs (8,075 acres of sagebrush) could offset some losses of sagebrush steppe from development of processing facilities through additional offsite mitigation and could provide future sources of forage over the long-term if revegetation efforts are successful. Minimizing loss of sagebrush steppe and applying mitigation efforts could allow sagebrush steppe vegetation resources to grow and regenerate within the Planning Area as revegetation efforts are completed.

Impacts Specific to Alternative B2 Only

In Alternative B2, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would reduce impacts to vegetation that would result from the concurrent development of oil and gas and potash as described in Alternative A. The impacts to vegetation from the limited potash development provided in Alternative B1 would be greater than the exclusion of potash development in Alterative B2.

Alternative B2 would substitute oil and gas well drilling for potash well drilling within the PLAs established in Alternative B1 and the impacts to vegetative resources would be similar. The major difference between Alternative B1 and Alternative B2 is that Alternative B2 eliminates the 3,037 acres of surface disturbance, and the associated potential adverse impacts to vegetative resources that could result from the construction of potash processing facilities within the 42,492 acres of PPFAs established in Alternative B1.

Managing the Planning Area as open only for oil and gas leasing (closed to potash leasing) would prevent surface disturbance from potash leasing and development and could reduce vegetation and soil loss from potash drilling operations, processing facilities and associated infrastructure. Closing the Planning Area to potash leasing could reduce surface disturbance and reduce removal of vegetation and soil resources. The reduction of disturbance could reduce further soil loss and erosion, allow for more contiguous vegetation resources, and prevent openings in habitat where invasive, non-native species could establish and spread. Oil and gas development would still occur within these acres, but there would be less density of disturbance from overlapping oil and gas and potash development and infrastructure.

Under Alternative B2, there are zero acres managed as open to oil and gas leasing with standard terms and conditions compared to 210,884 acres in Alternative A. Therefore, Alternative B2 could result in less damage or removal of vegetation resources as compared to Alternative A.

In Alternative B2, approximately 385 acres of land could initially be removed for oil and gas development in the next 15 years, which would result in direct loss of vegetation resources and could lead to the introduction and spread of noxious weeds, leading to additional degradation or loss of vegetation resources. Over the long-term, reclamation would occur and vegetation would re-establish within 108 acres, leaving only 277 acres of net vegetation loss (66 fewer acres than Alternative A). Reclaimed areas could provide new areas of native vegetation resources as restoration efforts are completed.

Applying CSU and TL stipulations to oil and gas leasing in Alternative B2 would have the same impacts to vegetation resources as those described in Alternative B1.

In Alternative B2, applying an NSO stipulation for oil and gas leasing would prevent surface development within 499,008 acres, 365,434 more acres as compared to Alternative A and a similar amount of acreage as compared to Alternative B1. Impacts to vegetation resources would be the same as those described under Alternative B1 and less than those described under Alternative A.

Impacts to vegetation resources from closing 753 acres to oil and gas leasing would be the same as described under Alternative A.

Table 4-60 displays the difference in acres of vegetation cover type by leasing stipulation between the stipulated acres in Alternative A compared to Alternative B2. As shown in the table, Alternative B2 covers includes fewer acres of CSU, however, Alternative B2 includes and many more acres of NSO are included under Alternative B1 as compared to Alternative A. Therefore, Alternative B2 protects more acreage of vegetation with an NSO stipulation than does Alternative A. Acreage closed in Alternatives A and B2 is identical.

Table 4-60. Vegetation Cover Type by Leasing Stipulation in Alternatives A and B2

Vegetation Cover Type	Alt. B2 CSU (acres)	Alt. A CSU (acres)	Alt. B2 NSO (acres)	Alt. A NSO (acres)	Alts. A and B2 Closed (acres)
Unclassified	1,216	1,299	1,689	1,145	35
Blackbrush	60,688	75,598	128,113	35,435	28
Disturbed Areas	528	1,975	1,474	0	0
Douglas Fir / Mixed Conifer	8	13	14	0	0
Dunes	10,319	6,018	12,804	2,142	0
Grasslands	11,334	15,405	14,548	2,892	6
Invasives	2,477	5,271	8,614	3,441	132
Mountain Shrub	35	169	202	0	0
Pinyon-Juniper	91,471	184,224	229,312	68,485	418
Ponderosa Pine	2	10	31	0	0
Riparian / Wetlands	33	1,377	1,939	201	0
Sagebrush	31,845	60,552	36,428	1,296	0
Salt Desert Shrub	75,850	86,582	63,840	15,451	134
Total	**285,806**	**-**	**499,008**	**-**	**753**

Impacts to vegetation resources in Alternative B2 from applying a TL stipulation to saline soils would be the same as those described in Alternative A and less than those described in Alternative B1.

In Alternative B2, minimizing impacts to sagebrush steppe through a CSU stipulation could reduce loss of sagebrush steppe vegetation to a greater degree than Alternative A. Impacts to vegetation resources would be the same as described under Alternative B1.

4.18.5 Impacts from Alternative C

In Alternative C, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would result in the same impacts to vegetation as those described in Alternative B2.

Impacts to vegetation resources by maximizing oil and gas lease size and thus reducing or eliminating redundant infrastructure would be the same as those described in Alternative B.

Applying the Baseline CSU stipulation in Alternative C for oil and gas leasing and development could reduce surface disturbance when compared to Alternative A. Impacts to vegetation resources would be the same as those described under Alternatives B1 and B2.

Under Alternative C, as in Alternatives B1 and B2, there are zero acres managed as open to oil and gas and potash leasing with standard terms and conditions as compared with the 210,884 acres in Alternative A. Therefore, Alternative C could result in the less damage or removal of vegetation resources as compared to Alternative A.

In Alternative C, approximately 74 acres of land could initially be removed for oil and gas development in the next 15 years, which would result in direct loss of vegetation resources and could lead to the introduction and spread of noxious weeds, leading to additional loss or degradation of vegetation resources. Over the long-term, reclamation would occur and vegetation would re-establish within 21 acres, leaving only 53 acres of net vegetation loss (290 fewer acres than Alternative A). Reclaimed areas could provide new areas of native vegetation resources as restoration efforts are completed.

Alternative C applies CSU and TL stipulations to oil and gas leasing on 54,799 acres, which is much less acreage than Alternatives A and B. While Alternative C has fewer acres that are managed with a CSU or TL stipulation, these acres are managed more restrictively (NSO and closed). Thus, Alternative C provides more protection to vegetation resources than do Alternatives A and B.

Applying an NSO stipulation to oil and gas leasing in Alternative C would prevent surface-disturbing activities from oil and gas development on 550,599 acres, which is 412,496 more acres as compared to Alternative A, and 51,511 acres more than Alternatives B1 and B2. Impacts would be similar to those described under Alternatives A, B1, and B2, but would apply to a much larger area, which would protect vegetation resources from damage or removal, prevent soil loss, and reduce erosion.

Under Alternative C, closing 180,169 acres to oil and gas leasing and development would preclude surface disturbance on 179,416 more acres than Alternatives A, B1, and B2. Impacts to vegetation resources would be similar to those described under Alternative A, but would apply to far more acres of vegetation resources.

Table 4-61 displays the difference in vegetation cover type by leasing stipulation in Alternative A compared to Alternative C. As shown in the table, Alternative C includes fewer acres of CSU; however, Alternative C includes more acres of NSO and closed as compared to Alternative A. Therefore, Alternative C protects more acres with an NSO stipulation or by closure than does Alternative A. See Table 4-58 and Table 4-60 for acreage comparisons of vegetation cover type by leasing stipulation in Alternatives B1 and B2.

Table 4-61. Vegetation Cover Type by Leasing Stipulation in Alternatives A and C

Vegetation Cover Type	Alt. C CSU (acres)	Alt. A CSU (acres)	Alt. C NSO (acres)	Alt. A NSO (acres)	Alt. C Closed (acres)	Alt. A Closed (acres)
Unclassified	587	1,229	1,026	1,145	1,328	35
Blackbrush	2,281	75,598	133,438	35,435	53,109	42
Disturbed Areas	420	1,975	1,583	0	-	0
Douglas Fir / Mixed Conifer	1	13	21	0	-	0
Dunes	146	6,018	20,650	2,142	2,327	0
Grasslands	1,332	15,405	18,715	2,892	5,841	7

Vegetation Cover Type	Alt. C CSU (acres)	Alt. A CSU (acres)	Alt. C NSO (acres)	Alt. A NSO (acres)	Alt. C Closed (acres)	Alt. A Closed (acres)
Invasives	406	5,271	5,281	3,441	5,536	136
Mountain Shrub	4	169	231	0	2	0
Pinyon-Juniper	20,082	184,224	223,391	68,485	77,728	528
Ponderosa Pine	1	10	32	0	-	0
Riparian / Wetlands	1	1,377	1,660	201	311	0
Sagebrush	10,052	60,552	52,852	1,296	5,369	0
Salt Desert Shrub	19,488	86,582	91,720	15,451	28,617	214
Total	**54,801**	**-**	**550,600**	**-**	**180,168**	**-**

Impacts to vegetation resources from applying a TL stipulation in Alternative C to saline soils would be the same as those described in Alternatives A and B.

Impacts to vegetation resources from applying a CSU stipulation in Alternative C for offsite reclamation for areas of saline soils would be the same as those described in Alternative B. There is no requirement for offsite reclamation in Alternative A.

In Alternative C, applying a CSU stipulation on slopes between 21 percent and 30 percent (Table 4-56) could protect or minimize damage or loss of hillside and downslope vegetation and could prevent landslides and heavy erosion on slopes that could result in larger losses of vegetation resources (46,525 acres). Erosion control plans could reduce vegetation damage or loss, soil loss, and runoff in areas where development occurs. Applying an NSO stipulation in Alternative C to slopes greater than 30 percent would provide direct protection of vegetation in areas with potential for heavy runoff and erosion when disturbed and would prevent further vegetation and soil loss. These stipulations provide more protection for vegetation resources located along steep slopes than is provided in Alternatives A and B because Alternative C provides an NSO stipulation to slopes greater than 30 percent.

Applying an NSO stipulation in Alternative C to preclude mineral activities within public water reserves, 100-year floodplains and within 650 feet of intermittent and perennial streams, rivers, riparian areas, wetlands, water wells, lakes, and springs (91,558 acres) provides the greatest protection for vegetation resources as compared to Alternatives A and B, with larger buffer distances and more acreage protected. Alternative C protects 41,063 more acres than Alternative A and 21,772 more acres than Alternative B.

Applying an NSO stipulation for impaired water bodies to preclude mineral activities within 1,000 feet of the Colorado River and Fisher Creek (6,883 acres) would allow for additional protection of wetland, riparian and upland vegetation in these areas, 2,293 more acres compared to Alternative B. Impaired water bodies were not specifically addressed in Alternative A.

Impacts to vegetation resources from minimizing impacts to sagebrush steppe through the Baseline CSU stipulation and BMPs would be similar to Alternative B, but the Baseline CSU would apply to all ecological conditions of sagebrush steppe habitat, protecting a much larger area of sagebrush steppe habitat than Alternative B. Alternative A does not specifically address sagebrush steppe habitat.

Impacts to vegetation resources from applying BMPs for oil and gas leasing would be the same as Alternative B.

4.18.6 Impacts from Alternative D

In Alternative D, impacts to vegetation resources from maximizing oil and gas lease size and thus reducing or eliminating redundant infrastructure from oil and gas development would be the same as those described in Alternatives B and C.

Impacts to vegetation resources from not issuing oil and gas leases within PLAs (103,619 acres) would be the same as those described in Alternative B1.

Impacts to vegetation resources from applying a CSU stipulation to all potash leases that requires processing facilities to be located within a PPFA (42,492 acres) would be similar to Alternative B1; however, an exception could allow for a small-scale potash processing facilities within the PLAs, allowing an additional disturbance of up to 100 acres. If the smaller potash processing facility were to be developed, vegetation would be removed and further soil loss could occur, which could lead to additional loss or damage of vegetation resources. Invasive, non-native plant species could be introduced and spread by vehicles and machinery during operation of the facilities, which could change vegetation composition and function, making habitat inhospitable for native plant species and could lead to further losses of native vegetation. Table 4-62 shows the types of vegetation within the proposed PPFAs by lease stipulation. NSO stipulations for ephemeral drainages on 2,528 acres would protect those acres of vegetation from damage or removal, the CSU/TL stipulation areas would allow for controlled development, with the greatest possible losses of vegetation types being salt desert shrub (21,566 acres) and sagebrush (8,075 acres).

Table 4-62. Vegetation Cover Type within Potash Processing Facility Areas for Alternative D by Leasing Stipulation

Vegetation Cover Type	Leasing Stipulation	
	CSU (acres)	NSO (acres)
Unclassified	26	1
Blackbrush	4,454	184
Dunes	1,150	97
Grasslands	492	15
Invasives	92	18
Pinyon-Juniper	4,107	239
Riparian / Wetlands	2	1
Sagebrush	8,075	346
Salt Desert Shrub	21,566	1,627
Total	**39,964**	**2,528**

Applying the Baseline CSU stipulation for all mineral development on 213,218 acres could reduce surface disturbance when compared to Alternative A, which primarily consists of timing limitations. Impacts to vegetation resources from applying the Baseline CSU stipulation would be very similar to Alternative B1, but it would apply to 5,033 more acres. Under Alternative C, the Baseline CSU stipulation would be applied

to fewer acres compared to Alternative D because more acres in Alternative C are protected by NSO stipulations or are closed.

Alternative D provides exceptions to the NSO stipulation for visual resources, the Baseline CSU stipulation, and the CSU stipulation for potash leases that would allow small-scale potash processing facilities within PLAs. These exceptions could result in additional development activity, surface disturbance, vegetation loss, erosion, and soil loss. These exceptions mean that Alternative D provides less protection to vegetation than does Alternative B1.

Under Alternative D, as in Alternatives B1, B2, and C, there are zero acres managed as open to oil and gas and potash leasing with standard terms and conditions as compared with the 210,884 acres in Alternative A. Therefore, Alternative D could result in the less damage or removal of vegetation resources as compared to Alternatives A.

In Alternative D, approximately 344 acres of land could initially be removed for oil and gas development in the next 15 years, which would result in direct loss of vegetation resources and could lead to the introduction and spread of noxious weeds, leading to additional loss or damage to vegetation resources. Over the long term, reclamation would occur and vegetation would re-establish within 96 acres, leaving 248 acres of net vegetation loss (95 fewer acres than Alternative A). Reclaimed areas could provide new areas of native vegetation resources as restoration efforts are completed.

Applying CSU and TL stipulations in Alternative D to oil and gas leasing on 230,675 acres would result in similar impacts to vegetation resources as those described in Alternatives B1 and B2. While Alternative D has 209,781 fewer acres than Alternative A that are managed with a CSU or TL stipulation, all of these acres are managed more restrictively (NSO and closed) in Alternative D. Thus, Alternative D provides more protection to vegetation resources than does Alternative A. While Alternative D has 175,966 more acres than Alternative C that are managed with a CSU or TL stipulation, the majority of these acres are managed more restrictively in Alternative C. Thus, Alternative C provides more protection to vegetation resources than does Alternative D.

Applying an NSO stipulation in Alternative D to oil and gas leasing would prevent surface-disturbing activities from oil and gas development on 305,899 acres, which is 172,325 more acres as compared to Alternative A, but 245,700 acres fewer than Alternative C. While Alternatives B1 and B2 manage 146,390 more acres with an NSO stipulation as opposed to Alternative D, the majority of these 146,390 acres are managed as closed in Alternative D. Thus, Alternative D provides more protection to vegetation resources than do Alternatives A, B1, and B2, but less protection in Alternative C.

Closing 145,284 acres to oil and gas leasing in Alternative D, 144,531 more acres than Alternatives A and B, would prevent damage or loss of vegetation resources from development activities, retain stable soil resources, prevent erosion or runoff and protect an intact ecosystem. The removal of future leasing activities would prevent the introduction and spread of invasive, non-native plant species from machinery and vehicles, further supporting native vegetation communities and ecosystems.

Table 4-63 displays the difference in vegetation cover type by leasing stipulation in Alternative A compared to D. As shown in the table, Alternative D includes fewer acres of CSU; however, Alternative D includes more acres of NSO as compared to Alternative A. Therefore, Alternative D protects more acres with an NSO stipulation or by closure than does Alternative A. See Table 4-58 for Alternative B1, Table 4-60 for Alternative B2, and Table 4-61 for Alternative C for vegetation cover type by leasing stipulation for each alternative.

Table 4-63. Vegetation Cover Type by Leasing Stipulation in Alternatives A and D

Vegetation Cover Type	Alt. D CSU (acres)	Alt. A CSU (acres)	Alt. D NSO (acres)	Alt. A CSU (acres)	Alt. D Closed (acres)	Alt. A Closed (acres)
Unclassified	1,177	1,299	1,360	1,145	299	35
Blackbrush	42,757	75,598	72,306	35,435	45,605	42
Disturbed Areas	528	1,975	1,474	0	-	0
Douglas-fir / Mixed Conifer	8	13	14	0	-	0
Dunes	5,305	6,018	9,613	2,142	599	0
Grasslands	7,919	15,405	8,079	2,892	5,368	7
Invasives	2,371	5,271	4,931	3,441	3,444	136
Mountain Shrub	35	169	200	0	2	0
Pinyon-Juniper	72,789	184,224	146,998	68,485	60,255	528
Ponderosa Pine	2	10	31	0	-	0
Riparian / Wetlands	23	1,377	1,716	201	183	0
Sagebrush	25,298	60,552	23,183	1,296	3,958	0
Salt Desert Shrub	72,553	86,582	35,994	15,451	25,573	214
Total	**230,765**	**-**	**305,899**	**-**	**145,284**	**-**

In Alternative D, potash leasing would only be permitted within the PLAs (103,619 acres), with 57,308 of these acres available for potash leasing with CSU and TL stipulations and the remaining 45,311 acres available with NSO stipulations. Impacts to vegetation resources would be very similar to those impacts from oil and gas leasing. Vegetation cover type by leasing stipulation are displayed in Table 4-64.

Table 4-64. Vegetation Cover Types within the Potash Leasing Areas by Leasing Stipulation for Alternative D

Vegetation Cover Type	CSU Stipulation (acres)	NSO Stipulation (acres)
Unclassified	45	60
Blackbrush	17,903	10,258
Dunes	5,613	1,993
Grasslands	3,751	771
Invasives	108	368
Pinyon-Juniper	18,737	22,423
Riparian / Wetlands	10	40
Sagebrush	7,091	8,744
Salt Desert Shrub	4,051	1,654

In Alternative D, applying a CSU stipulation to all potash leases that requires processing facilities to be located within a PPFA would have the same impacts to vegetation resources as those described in Alternative B1. Alternatives B2 and C do not provide for potash leasing. As a result, there would be no impacts to vegetation resources resulting from potash processing facilities.

Impacts to vegetation resources from closing approximately 681,948 acres to potash leasing in Alternative D are the same as those described in Alternative B1. However, Alternatives B2 and C close the entire Planning Area to potash leasing and development and therefore provide the greatest protection to vegetation resources.

In Alternative D, impacts to vegetation resources by applying a TL stipulation to saline soils would be the same as described under Alternative B1. Alternatives A and C provide more protections to vegetation in saline soils.

Impacts to vegetation resources from applying a CSU stipulation for offsite reclamation in Alternative D for areas of saline soils would be the same as those described in Alternative B.

Impacts to vegetation resources from applying a CSU stipulation in Alternative D for slopes greater than 21 percent would be the same as those described in Alternative B.

In Alternative D, impacts to vegetation resources from applying an NSO stipulation to preclude mineral activities within public water reserves, 100-year floodplains and within 500 feet of intermittent and perennial streams, rivers, riparian areas, wetlands, water wells, lakes, and springs (69,786 acres) and applying an NSO stipulation to preclude mineral activities within 750 feet of the Colorado River and Fisher Creek (4,590 acres) would be the same as those described under Alternative B, but less protection than Alternative C.

Impacts to vegetation resources from minimizing impacts to sagebrush steppe through the Baseline CSU stipulation would be the same as those described in Alternatives B1, B2, and C.

Impacts to vegetation resources from applying BMPs for mineral leasing and development would be the same as those described in Alternatives B and C.

4.19 VISUAL RESOURCE MANAGEMENT/AUDITORY MANAGEMENT (SOUNDSCAPES)

This section presents potential impacts to visual resources and soundscapes from implementing management actions presented in Chapter 2. Existing conditions concerning visual resources and national soundscapes management are described in Chapter 3.

4.19.1 Assumptions

- VRM objectives would be achieved.
- VRM objectives would provide for varying degrees of change (impact) to the visual quality of the landscape.
- All alternatives would conform to visual resource decisions in the existing RMPs.
- Contrast rating analyses would be completed during project-level implementation.
- All management actions that permit surface disturbances could have adverse impacts on visual resources to some degree by introducing new visual elements onto the landscape or intensifying existing visual elements by altering the line, form, color, and/or textures that characterize the existing landscape.
- Changes in air quality, either from smoke, dust, haze, or other pollutants could potentially reduce or degrade scenic quality by obscuring distant views. It should be noted, however, that the Clean Air Act sets limits on the allowable degradation of visibility within the adjacent National Parks. Arches and Canyonlands National Parks have been designated as areas requiring the highest level of visibility (PSD Class I), so smoke or haze that originates within the Planning Area cannot exceed the allowable National Park Service (NPS) PSD I scenic quality standards for air pollutants.

4.19.2 Impacts Common to All Alternatives

Dust abatement measures to comply with UAC Regulations R446-1-4.5.3 and R307-205 would support visual quality by providing clear scenic vistas. Maintaining air quality in accordance with UAC Regulations R446-1-4.5.3 and R307-205 would support visual quality by providing clear scenic vistas.

4.19.3 Impacts from Alternative A (No Action)

Maintaining generally undeveloped landscapes in the backgrounds of popular filming locations would reduce possible changes to scenic elements of the landscape, preserve scenic quality, and prevent changes in line, form, color, and texture of the visual environment.

In Alternative A, oil and gas and potash development and associated facilities could occur concurrently on the same tract of land that is available to mineral leasing and development. This could result in higher concentrations of development and redundant infrastructure. Although drilling for oil and gas and potash is similar, the production of potash requires the use of potash processing facilities, which involves large tracts of land over a long period of time. Mineral development would result in soil and vegetation disturbance and the presence of permanent structures that could degrade visual resources.

Managing areas with high potential of development for oil and gas as VRM Class III could allow moderate changes to visual resources that could attract viewer attention and introduce contrast to viewsheds in the

form of changes to form, line, texture, and color. Managing VRM Class I areas with an NSO stipulation (13,384 acres), preserves visual resources in the most visually sensitive parts of the Planning Area. Designating VRM Class II on scenic driving corridors (44,953 acres) would ensure that any changes to the form, line, texture, or color of these scenic landscapes would not attract the attention of a casual viewer. Applying CSU stipulation on VRM Class II (324,721 acres), including lands around Arches National Park, could protect viewsheds from key observation points, but could allow some visual impacts, as long as they would not attract the attention of the casual viewer. No specific visual resource protections exist under this alternative to protect viewsheds near Canyonlands National Park and along the Colorado and Green Rivers rims, nor to protect night skies and natural soundscapes. Not all of the visual horizon of the two adjacent National Parks would be protected from visual impacts under this alternative. Mineral development facilities could exist in places that would disrupt the skyline view as seen from the Colorado and Green Rivers. Light pollution from mineral development could diminish the number of stars visible, thereby reducing the visual quality of the night sky.

Oil and gas and potash leasing could both reduce the quality of visual resources in some parts of the Planning Area, especially undeveloped areas and VRM Class II areas. Wells and associated facilities, potash processing facilities, pipelines, and the visual impact of facilities in otherwise natural areas would lead to changes in the form, line, texture, and color of the landscape. These adverse impacts to visual resources would occur primarily on 210,884 acres subject to standard terms and conditions (open). On about 440,386 acres managed with CSU and TL stipulations, visual impacts could occur. However, 239,762 acres are managed as VRM II with a CSU stipulation providing protective measures. These measures would require actions such as shading, location, and screening for mineral operations. While these actions may mitigate visual impacts, it is difficult to ensure that all adverse impacts to visual resources would be eliminated.

Managing 133,574 acres with an NSO stipulation would eliminate most mineral development impacts to visual resources, with the possible exception of fugitive dust coming from adjacent areas where horizontal drilling might be possible. On 753 acres closed to mineral leasing, mineral development impacts to visual resources would be eliminated.

Compared to oil and gas leasing, potash leasing, which would occur with the same leasing restrictions and in the same areas as oil and gas, could have even greater impacts to visual resources. Well spacing could be more concentrated and processing facilities would be many times larger and more industrial. Together, oil and gas and potash leasing could occur on lands open to leasing with standard terms and conditions and with minor constraints (CSU and TL stipulations) on 83 percent of the Planning Area. Table 4-65 shows the acreage of each mineral leasing stipulation by VRM Class for each alternative.

Table 4-65. Mineral Leasing Stipulations by Visual Resource Management Class by Alternative

	Alternative A	Alternative B1	Alternative B2	Alternative C	Alternative D
Oil and Gas					
VRM Class I					
Open	0	0	0	0	0
CSU	0	0	0	0	0
NSO	12,445	12,632	12,632	0	0
Closed	931	752	752	13,384	13,384
Deferred (PLA)	0	0	0	0	0

	Alternative A	Alternative B1	Alternative B2	Alternative C	Alternative D
VRM Class II					
Open	601	0	0	0	0
CSU	239,762	0	0	0	0
NSO	80,210	296,716	324,721	183,668	185,784
Closed	29	0	0	141,053	110,932
Deferred (PLA)	0	28,005	0	0	28,005
VRM Class III					
Open	187,708	0	0	0	0
CSU	150,352	177,141	229,285	34,410	178,520
NSO	33,551	125,671	143,551	314,466	105,135
Closed	0	0	0	23,960	19,157
Deferred (PLA)	0	70,024	0	0	70,024
VRM Class IV					
Open	21,702	0	0	0	0
CSU	48,343	51,684	56.420	20,358	52,180
NSO	4280	17,194	18,206	52,540	14,970
Closed	0	0	0	1,728	1,728
Deferred (PLA)	0	5,748	0	0	5,748
Potash					
VRM Class I					
Open	0	0	0	0	0
CSU	0	0	0	0	0
NSO	12,445	0	0	0	0
Deferred (outside PLA)	931	0	0	0	0
VRM Class II					
Open	601	0	0	0	0
CSU	239,762	0	0	0	0
NSO	80,210	27,848	0	0	27,848
Deferred (outside PLA)	29	0	0	0	0
VRM Class III					
Open	187,708	0	0	0	0
CSU	150,352	52,143	0	0	52,386
NSO	33,551	17,881	0	0	17,637
Deferred (outside PLA)	0	0	0	0	0

	Alternative A	Alternative B1	Alternative B2	Alternative C	Alternative D
VRM Class IV					
Open	21,702	0	0	0	0
CSU	48,343	4,736	0	0	4,922
NSO	4280	1,011	0	0	826
Deferred (outside PLA)	0	0	0	0	0

In addition to the visual analysis provided by the VRM system, the BLM worked with the United States Geologic Service (USGS) to undertake an analysis of viewsheds most likely affected by minerals decisions. The resulting study identified those viewsheds within the Planning Area with the highest potential value for those recreationists for whom scenic qualities are an important part of their recreational experience. Table 4-66 displays the percentage of the Planning Area that is visible from high use recreation areas by lease category and alternative.

Table 4-66. Percentage of Planning Area Visible from High Use Recreation Areas by Lease Category and Alternative

Alternative	Open with Standard Stipulations	Oil and Gas		Potash		Closed	Non-BLM Land
		CSU/TL	NSO	CSU/TL	NSO		
A	20	50	13	50	13	0.1	18
B1	0	28	54	5	4	0.1	18
B2	0	23	49	0	0	0.1	18
C	0	5	56	0	0	20	18
D	0	23	31	5	4	18	18

Notes: "Non-BLM land" refers to land visible from high use recreation areas that is not managed by the BLM.
Alternative A exceeds 100 percent because potash and oil and gas lease categories are identical.

In Alternative A, where oil and gas and potash are managed with the same leasing stipulations, 20 percent of the visible land (from high use areas) is managed as open to mineral leasing with standard terms and conditions. About 50 percent of the visible land is managed with CSU and TL stipulations, some of which provide limited protection to the visible areas that are managed as VRM Class II. About 13 percent of the lands visible from high use recreation areas are managed to preclude surface disturbance (NSO and closed) and associated impacts to these important viewsheds.

4.19.4 Impacts from Alternative B

Applying a CSU stipulation to mitigate impacts to air quality would support visual quality by providing clear scenic vistas. Dust abatement measures, which include a CSU stipulation for a Fugitive Dust Control Plan and BMPs, would support visual quality by providing clear scenic vistas. Measures to control fugitive dust were not specifically addressed in Alternative A.

Requiring viewshed assessments with a CSU stipulation for cultural sites would preserve scenic quality in those areas. There is no viewshed assessment requirement in Alternative A.

Applying a CSU stipulation precluding visual intrusions within 1 mile of filming locations (177,594 acres) could reduce possible changes to scenic elements of the landscape, preserve scenic quality, and prevent changes in line, form, color, and texture of the visual environment. Possible exceptions to this CSU stipulation could be allowed for short-term impacts, which could temporarily reduce visual quality in filming locations. There are no lease stipulations to specifically protect filming locations in Alternative A.

As compared to Alternative A, maximizing the size of oil and gas lease parcels could reduce oil and gas development and infrastructure, which could reduce possible changes to scenic elements of the landscape, preserve scenic quality, and prevent changes in line, form, color, and texture of the visual environment as compared to Alternative A.

The use of visual BMPs could reduce impacts to visual resources more than under Alternative A. The application of BMPs could reduce impacts to visual resources through screening. The use of location and topography to screen development, painting and camouflage techniques, placing infrastructure near existing disturbance, and avoiding straight lines and edges could all reduce impacts to visual resources by reducing the visibility of infrastructure.

Applying the Baseline CSU stipulation to VRI Class II areas could reduce ground disturbance, reduce possible changes to scenic elements of the landscape, reduce impacts to scenic quality, and minimize changes in line, form, color, and texture of the visual environment as compared to Alternative A. However, the scenic quality of VRI Class II areas would be degraded as a result of mineral development regardless of well pad spacing. The Baseline CSU stipulation involves 208,185 acres in Alternative B1 and 222,289 acres in Alternative B2.

Applying an NSO stipulation to VRM Class I would have the same impact to visual resources as under Alternative A. Applying an NSO stipulation within 1 mile of backways and byways would reduce the adverse impacts to viewsheds as compared to those described in Alternative A. This NSO stipulation increases the area of protection from 44,953 acres (Alternative A) to 156,067 acres, as well as the degree of protection because Alternative A utilizes a CSU stipulation for VRM Class II.

Applying an NSO stipulation on VRM Class II (324,721 acres), on VRI Class II around Arches and Canyonlands National Parks, and along the rim of the Colorado and Green Rivers would eliminate all surface disturbances and protect visual resources on BLM lands adjacent to parks and along the rivers as compared to Alternative A, which utilizes a CSU stipulation for VRM Class II. Under Alternative A there are no stipulations on VRI Class II around the National Parks or on the rim of the rivers. Utilizing BMPs to reduce night sky impacts would help retain dark skies and protect night time views as compared to Alternative A, which is silent on night skies.

As compared to Alternative A, BMPs used to mitigate mineral operation noise would decrease impacts to the natural soundscape. Applying an NSO stipulation within 2.5 miles of National Park boundaries could reduce noise disturbances from mineral development. Therefore, this stipulation could reduce impacts to the natural soundscape of the adjoining National Parks.

Impacts Specific to Alternative B1 Only

Not issuing new oil and gas leases within Potash Leasing Areas PLA (103,619 acres) could help to minimize adverse impacts to visual resources. These adverse impacts could result from concurrent oil and gas and potash development, including potash processing facilities, which could occur under Alternative A. However, 43 percent of the Hatch Point PLA contains existing oil and gas leases. Therefore, there is potential for concurrent development of oil and gas and potash on these existing leases and a greater likelihood for adverse impacts to visual resources. Allowing potash leasing and development within PLAs on 103,619 acres could result in impacts to visual resources that may be found in these areas from surface-

disturbing potash related activities. If the acreage encompassed by PLAs were to become available solely for oil and gas leasing and development, the adverse impacts to visual resources would be similar to or less than the impacts identified for potash leasing and development. Alternative B1 does not allow potash leasing on 681,948 acres within the Planning Area, which would minimize adverse impacts to visual resources from concurrent oil and gas and potash development as compared to Alternative A.

A phased approach to potash leasing could help reduce impacts to visual resources as compared to Alternative A. By testing the feasibility of potash development, unnecessary surface disturbance would be avoided and appropriate mitigation measures applied. These measures would benefit visual resources.

Designating PLAs (103,619 acres) could cause changes to scenic elements to the landscape, such as changes in line, form, color, and texture of the visual environment in the Red Wash, Upper Ten Mile, and Hatch Point areas if potash is developed. Potash wells and infrastructure could conflict with visual resources by altering the natural landscape. However, of the 103,619 acres within PLAs, 27,848 acres are managed with an NSO stipulation for VRM II, which precludes potash development on VRM II acreage and protects visual resources. Conversely, designating the PLAs would eliminate the possibility of potash development and related adverse visual impacts in the remainder of the Planning Area that could occur under Alternative A. As compared to Alternative A, the area available for potash drilling is reduced from 651,270 acres to 103,619 acres (a 70 percent reduction).

Limiting the location of potash processing facilities to PPFAs outside VRI Class II and VRM Class II would retain the character of the landscape in those areas. Locating PPFAs only within VRM Class III and IV areas would reduce conflict with the visual management and could allow moderate to major changes to visual resources. In Alternative A, potash processing facilities could be located within VRI Class II areas resulting in substantial adverse impacts to visual resources. Thus, Alternative B provides much more protection for visual resources than does Alternative A. Compared to Alternative A, areas where potash processing facilities could impact visual resources would be reduced from 56 percent to 7 percent of the Planning Area.

Under Alternative B1 about 228,926 acres would be open to oil and gas leasing subject to CSU and TL stipulations (minor constraints). There are zero acres managed as open to oil and gas leasing under standard terms and conditions (open). These areas open to oil and gas leasing and development and with minor constraints comprise about 29 percent of the Planning Area. Within these areas, projected development for oil and gas would occur and the associated surface disturbance could adversely impact visual resources. The area managed as open and with minor constraints to oil and gas leasing and development is about 422,344 acres less than Alternative A. Therefore, there is much less likelihood for adverse impacts to visual resources associated with oil and gas development in Alternative B1 as compared to Alternative A. About 58 percent of the Planning Area is subject to NSO stipulations (452,269 acres) and closed to oil and gas leasing (753 acres). These major constraints would protect visual resources within these areas by precluding surface development. The area covered by major constraints for oil and gas leasing and surface development is about 313,723 acres more than Alternative A. Therefore, Alternative B1 offers far more protection for visual resources from impacts associated with oil and gas leasing and surface development than Alternative A.

Under Alternative B1, about 228,926 acres would be open to oil and gas leasing subject to CSU and TL stipulations (minor constraints). There are zero acres managed as open to oil and gas leasing under standard terms and conditions (open). These areas managed as open and with minor constraints to oil and gas leasing and development comprise about 29 percent of the Planning Area in Alternative B1. Within these areas, projected development for oil and gas would occur and the associated surface disturbance could adversely impact visual resources. The area managed as open and with minor constraints to oil and gas leasing and development is about 422,344 acres less than Alternative A. Therefore, there is much less likelihood for

adverse impacts to visual resources associated with oil and gas development in Alternative B1 as compared to Alternative A. About 58 percent of the Planning Area is subject to NSO stipulations (452,269 acres) and closed to oil and gas leasing (753 acres). These major constraints would protect visual resources within these areas by precluding development. The area covered by major constraints for oil and gas leasing and development is about 313,723 acres more than Alternative A. Therefore, Alternative B1 offers far more protection for visual resources from adverse impacts associated with oil and gas leasing and surface development than Alternative A.

In lands visible from high use recreation areas in Alternative B1, there are zero acres are managed as open to oil and gas leasing with standard terms and conditions, while 22 percent of the land visible from high use recreation areas is managed with CSU and TL stipulations (Table 4-66). Since VRM Class II areas are managed with an NSO stipulation in this alternative, there are no specific protections for viewsheds in lands managed with CSU and TL stipulations. About 50 percent of the land visible from high use recreation areas is managed to preclude surface disturbance (NSO and closed) and the associated impacts to these important viewsheds. Therefore, Alternative B1 provides more protection to viewsheds visible from high use recreation areas than that provided in Alternative A, which offers full protection to only 13 percent of these high visibility lands.

In Alternative B1, about 103,619 acres would be available to potash leasing and development within the PLAs. Within the PLAs, there are about 57,620 acres managed with CSU and TL stipulations (minor constraints) and zero acres managed as open with standard terms and conditions (open). Projected potash well drilling would occur within the PLAs in the areas managed as open and with minor constraints and the associated surface disturbance could adversely impact visual resources. The area managed as open and with minor constraints to potash leasing and development is about 593,650 acres less than Alternative A. Therefore, there is much less likelihood for adverse impacts to visual resources associated with potash development in Alternative B1 as compared to Alternative A. In addition, there are about 45,999 acres within the PLAs that are subject to NSO stipulations, which would protect visual resources by precluding potash surface development.

PLAs are located largely in lands that are not heavily visited by the public. As a result, 5 percent of the lands visible from high use recreation areas are open to potash leasing with CSU and TL stipulations, and 4 percent of the lands visible from high use recreation areas are managed to preclude surface disturbance (NSO and closed) and associated impacts to these important viewsheds. See Table 4-66 for these figures. Alternative B1 provides more protection to visible viewsheds from potash development than does Alternative A, which offers protection to only 13 percent of visible lands.

Impacts Specific to Alternative B2 Only

In Alternative B2, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would reduce impacts to visual resources that would result from the concurrent development of oil and gas and potash as described in Alternative A. The impacts to visual resources from the limited potash development provided in Alternative B1 would be greater than the exclusion of potash development in Alterative B2.

Alternative B2 would substitute oil and gas well drilling for potash well drilling within the PLAs established in Alternative B1 and the impacts to visual resources would be similar. The major difference between Alternative B1 and Alternative B2 is that Alternative B2 eliminates the 3,037 acres of surface disturbance, and the associated potential adverse impacts to visual resources, which could result from the construction of potash processing facilities within the 42,492 acres of PPFAs established in Alternative B1.

Under Alternative B2, about 285,806 acres would be open to oil and gas leasing subject to CSU and TL stipulations (minor constraints). There are zero acres managed as open to oil and gas leasing under standard terms and conditions (open). These areas managed as open and with minor constraints to oil and gas leasing and development comprise about 36 percent of the Planning Area. Within these areas, *projected* development for oil and gas would occur and the associated surface disturbance could adversely impact visual resources. The area managed as open and with minor constraints to oil and gas leasing and development is about 365,464 acres less than Alternative A. Therefore, there is much less likelihood for adverse impacts to visual resources associated with oil and gas development in Alternative B2 as compared to Alternative A. About 64 percent of the Planning Area is subject to NSO stipulations (499,008 acres) and closed to oil and gas leasing (753 acres). These major constraints would protect visual resources within these areas by precluding surface development. The area covered by major constraints for oil and gas leasing and surface development is about 360,466 acres more than Alternative A. Therefore, Alternative B2 offers far more protection for visual resources from impacts associated with oil and gas leasing and surface development than Alternative A.

In lands visible from high use recreation areas in Alternative B2, zero acres are open to oil and gas leasing with standard terms and conditions, while 28 percent of the land visible from high use recreation areas is managed with CSU and TL stipulations (Table 4-66). Since VRM Class II areas are managed with an NSO stipulation in this alternative, there are no protections for viewsheds in lands managed with CSU and TL stipulations. About 54 percent of the land visible from high use recreation areas is managed to preclude surface disturbance (NSO and closed) and associated impacts to these important viewsheds. Alternative B2 provides more protection to highly visited viewsheds than that provided in Alternative A, which offers full protection to only 13 percent of the high visibility lands. The protection provided to highly visited viewsheds is similar to that provided in Alternative B1.

In Alternative B2, there are zero acres open to potash development. No highly visited viewsheds would be impacted by the development of potash. Alternative B2 provides more protection to highly visited viewsheds from potash development than do Alternatives A and B1.

4.19.5 Impacts from Alternative C

In Alternative C, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would result in the same impacts to visual resources as those described in Alternative B2.

Applying a CSU stipulation to mitigate impacts to air quality would have the same impacts to visual resources as those described in Alternative B. Measures to control fugitive dust were not specifically addressed in Alternative A.

Requiring viewshed assessments for cultural sites would have the same impact to visual resources as described in Alternative B.

Applying an NSO stipulation on 177,594 acres of designated filming locations would prevent possible changes to scenic elements of the landscape, preserve scenic quality, and prevent changes in line, form, color, and text of the visual environment. This provides greater protection to visual resources as compared to Alternatives A and B.

Maximizing the size of oil and gas lease parcels would have the same impact to visual resources as those described in Alternative B.

The use of BMPs for mineral operations would have the same impact to visual resources as those described in Alternative B.

Impacts from applying the Baseline CSU stipulation to VRI Class II areas would have a similar impact to visual resources as those described in Alternative B.

Closing VRM Class I areas to mineral leasing would have a similar effect on visual resources as Alternatives A and B, except noise, traffic, and dust from adjacent areas where horizontal drilling might occur would be eliminated. Closing VRM Class I areas to mineral leasing would preclude drilling from adjacent lands to access the underlying Federal mineral resources. This would minimize potential impacts that could occur to the viewshed from the VRM Class I areas.

Applying an NSO stipulation on backways and byways would be similar to Alternative B, except the area with an NSO stipulation would be increased from 1 mile to 2 miles. This stipulation increases the area of visual protection from 156, 067 acres (Alternative B) to 267,524 acres (Alternative C).

Applying an NSO stipulation on VRM Class II areas (324,721 acres) would have the same beneficial impacts to visual resources as those described in Alternative B. Closing the immediate viewshed around Arches National Park, applying an NSO stipulation on viewsheds north of the park, applying a 3-mile buffer along the eastern boundary of Canyonlands National Park, and increasing the NSO stipulation along the Colorado and Green River rims out to 2 miles increases the protection of the visual resource values as compared to Alternatives A and B. Applying a CSU stipulation to reduce night sky impacts would protect dark skies more than those described in Alternative B and further preserve the visual quality of night time views. No provisions to protect night skies were provided in Alternative A.

As compared to Alternative A, BMPs used to mitigate mineral operation noise would decrease impacts to the natural soundscape. Applying a CSU stipulation requiring effective noise mitigation measure within 6.1 miles of National Park boundaries would reduce noise impact from mineral related activities. This provides greater protection for National Park soundscapes compared to Alternatives A and B. Applying an NSO stipulation within 2.8 miles of National Park boundaries could reduce noise disturbances from mineral development as compared to the 2.5 mile noise buffer in Alternative B. Therefore, this stipulation could reduce impacts to the natural soundscape of the adjoining National Parks. Compared to Alternatives A and B, the NSO stipulation provides more protection to the soundscape of the adjoining National Parks.

For Alternative C, about 54,799 acres would be open to oil and gas leasing subject to CSU and TL stipulations (minor constraints). There are zero acres managed as open to oil and gas leasing with standard terms and conditions (open). These areas managed as open and with minor constraints to oil and gas leasing and development comprise about 7 percent of the Planning Area. Within these areas, projected development for oil and gas would occur and the associated surface disturbance could adversely impact visual resources. The area managed as open and with minor constraints to oil and gas leasing and development is far less than Alternatives A, B1, and B2. Therefore, there is much less likelihood for adverse impacts to visual resources associated with oil and gas development in Alternative C as compared to Alternatives A, B1, and B2. About 93 percent of the Planning Area is subject to NSO stipulations (550,599 acres) and closed to oil and gas leasing (180,169 acres). These major constraints would protect visual resources within these areas by precluding surface development. The area covered by major constraints for oil and gas leasing and surface development is far more than Alternatives A, B1, and B2. Therefore, Alternative C offers far more protection for visual resources from impacts associated with oil and gas leasing and surface development than Alternatives A, B1, and B2.

In lands visible from high use recreation areas in Alternative C, zero acres are managed as open to oil and gas leasing with only standard stipulations, while 5 percent of the land visible from high use recreation

areas is managed with CSU and TL stipulations (Table 4-66). About 86 percent of the land visible from high use recreation areas is managed to preclude surface disturbance (NSO and closed) and associated impacts to these important viewsheds. Alternative C provides more protection to highly visited viewsheds than that provided in Alternatives A, B1, and B2, which offer full protection to only 13 percent, 50 percent, and 54 percent respectively of the high visibility lands.

In Alternative C, there are zero acres managed as open to potash development. No highly visited viewsheds would be impacted by the development of potash. Alternative C provides the same protection to highly visited viewsheds from potash development than is provided in Alternative B2, and more than in Alternatives A and B1.

4.19.6 Impacts from Alternative D

Applying a CSU stipulation to maintain air quality would have the same impact to visual resources as those describe in Alternatives B and C. Dust abatement measures would have the same impact to visual resources as those described in Alternatives B and C. Measures to control fugitive dust were not specifically addressed in Alternative A.

Requiring viewshed assessments with a CSU stipulation for cultural sites would have the same impact to visual resources as those described in Alternatives B and C. There is no viewshed assessment requirement in Alternative A.

Applying a CSU stipulation precluding visual intrusions to 177,594 acres of designated filming locations would have the same impact to visual resources as those described in Alternative B, but less protection than Alternative C. There is no specific stipulation for filming locations in Alternative A.

Impacts to visual resources from maximizing the size of oil and gas lease parcels would be the same as those described in Alternatives B and C.

The use of BMPs for mineral operations would have the same impacts to visual resources as those described in Alternatives B and C.

Impacts to visual resources from applying a Baseline CSU stipulation would be similar to those described in Alternative B, although an exception could be granted (Appendix A), which could increase the density of well spacing in some instances. This additional drilling could impact the form and line of viewsheds as compared to Alternative B. However, impacts would be less than in Alternative A and more than Alternatives B and C where the exception does not apply.

Designating PLAs (103,619 acres) would have a similar impact to visual resources as those described in Alternative B1, except that a small-scale potash processing facility could be located within the PLAs. This facility could disturb up to 100 acres, which, depending on the location could reduce the visual quality of visual settings. However, limiting potash leasing to PLAs would reduce the adverse impacts to visual resources from those described in Alternative A.

Limiting the location of potash processing facilities to PPFAs and locating them largely outside of VRI Class II and VRM Class II areas would have the same impacts to visual resources as those described in Alternative B1.

A phased approach to potash leasing would have the impacts to visual resources as those described in Alternative B1 and could help reduce impacts to visual resources as compared to Alternative A. In Alternatives B2 and C, the entire Planning Area is closed to potash leasing.

Closing VRM Class I areas to mineral leasing would have the same impact to visual resources as described in Alternative C and would provide more protection than Alternatives A and B. Applying an NSO stipulation to mineral leasing on backways and byways would have a similar impact as described in Alternative B; however, an exception could be granted, which would increase visual impacts from some observation points, especially backcountry viewpoints. Alternative D provides more protection to visual resources than Alternative A but less than Alternative C.

Applying an NSO stipulation to mineral leasing on VRM Class II (324,721 acres), would have the same impacts to visual resources as those described in Alternative B. However, an exception to the NSO stipulation in VRM Class II areas may be allowed in locations outside of the viewshed of key observation points. This could increase visual impacts for some backcountry users.

Closing VRM Class II and VRI Class II areas around Arches National Park would have the same impacts to visual resources as those described in Alternative C, which is a greater level of protection by the NSO stipulation applied in Alternative B and the CSU stipulation applied to VRM Class II areas in Alternative A. However, the viewshed north of Arches National Park, beyond the VRI Class II areas, would not be managed with an NSO stipulation in Alternative D. Therefore, Alternative D affords less protection for the viewsheds around Arches National Park than does Alternative C, but more than Alternatives A and B.

BMPs to reduce night sky impacts would have the same impact to visual resources as those described in Alternative B, but less protection than the CSU stipulation applied for night skies in Alternative C. Night skies mitigation is not provided in Alternative A. BMPs to mitigate noise would have the same impact as Alternative C. In addition, a CSU stipulation regulating noise generation from mineral development is also applied to a 6.1-mile buffer around the National Parks as it is in Alternative C. Applying an NSO stipulation for noise within 2.5 miles of National Park boundaries would have the same impact to visual resources as those described in Alternative B, but less than the 2.8 miles of NSO applied in Alternative C. Noise mitigation is not provided in Alternative A.

Under Alternative D, about 230,765 acres would be open to oil and gas leasing subject to CSU and TL stipulations (minor constraints). There are zero acres managed as open to oil and gas leasing under standard terms and conditions (open). These areas managed as open and with minor constraints to oil and gas leasing and development comprise about 29 percent of the Planning Area. Within these areas, projected development for oil and gas would occur and the associated surface disturbance could adversely impact visual resources. The area managed as open and with minor constraints to oil and gas leasing and development is about 420,505 acres less than Alternative A. Therefore, there is much less likelihood for adverse impacts to visual resources associated with oil and gas surface development in Alternative D as compared to Alternative A, a similar likelihood for adverse impacts as compared to Alternatives B1 and B2, and greater likelihood for adverse impacts as compared to Alternative C.

About 57 percent of the Planning Area is subject to NSO stipulations (305,899 acres) and closed to oil and gas leasing (145,284 acres). These major constraints would protect visual resources within these areas by precluding surface development. The area covered by major constraints for oil and gas leasing and development is about 311,888 acres more than Alternative A, slightly less (1,839 acres) than Alternative B1, less than (48,578 acres) Alternative B2, and much less than (279,585 acres) than Alternative C. Therefore, Alternative D offers far more protection for visual resources from impacts associated with oil and gas leasing and surface development than Alternative A, similar protection than Alternatives B1 and B2, and much less than Alternative C.

In lands visible from high use recreation areas in Alternative D, zero acres are managed as open to oil and gas leasing with only standard stipulations, while 23 percent of the land visible from high use recreation areas is managed with CSU and TL stipulations (Table 4-66). About 48 percent of the land visible from

high use recreation areas is managed to preclude surface disturbance (NSO and closed) and associated impacts to important viewsheds. Alternative D provides more protection to highly visited viewsheds than that provided in Alternative A, which offers full protection to only 13 percent of the high visibility lands. Alternative D provides similar protection to highly visited viewsheds as is provided in Alternative B1 and B2, but less protection than provided in Alternative C.

In Alternative D, about 103,619 acres would be available to potash leasing and development within the PLAs. Within the PLAs, there are about 57,620 acres managed with CSU and TL stipulations (minor constraints) and zero acres managed as open with standard terms and conditions (open). Projected potash well drilling would occur within the PLAs in the areas managed as open and with minor constraints and the associated surface disturbance could adversely impact visual resources. The area managed as open and with minor constraints in Alternative D is about 593,650 acres less than Alternative A and the same as Alternative B1. Therefore, there is much less likelihood for adverse impacts to visual resources associated with potash development in Alternative D as compared to Alternative A. In addition, out of the 103,619 acres available for potash leasing there about 45,999 acres that are subject to NSO stipulations, which would protect visual resources by precluding potash surface development. In Alternatives B2 and C, no leasing and surface development of potash would occur.

PLAs are located largely in lands that are not heavily visited by the public. As a result, 5 percent of the lands visible from high use recreation areas are open to potash leasing with CSU and TL stipulations, and 4 percent of the lands visible from high use recreation areas are managed to preclude surface disturbance (NSO and closed) and associated impact to important viewsheds. See Table 4-66 for these figures. Alternative D provides more protection to highly visited viewsheds from potash development than does Alternative A, which offers protection to only 13 percent of visible lands. Alternative D provides comparable protection to highly visited viewsheds as provided in Alternative B1. Alternatives B2 and C do not allow for potash development.

4.20 WILDLIFE AND FISHERIES

This section presents potential impacts to habitat for wildlife and fish from implementing management actions presented in Chapter 2. Existing conditions concerning wildlife and fisheries resources are described in Chapter 3.

4.20.1 Assumptions

- The more acreage of habitat protected from surface disturbance or human presence, the less potential for adverse impact to targeted species.
- Substantial modifications to habitat suitability can impact the survivability and viability of populations (e.g., higher winter mortality, reduced reproductive success).
- Crucial winter ranges, transitional ranges, and birthing areas are important wildlife habitat.
- Natural variability in wildlife health, population levels, and habitat conditions would continue. Periods of mild or severe weather as well as outbreaks of wildlife disease or insects/diseases that impact habitat (e.g., mountain pine beetle, blister rust, mistletoe, and bleeding rust) could impact wildlife population levels.
- Precise, quantitative estimates of impacts generally are not possible because the exact locations of future actions are unknown, population data for wildlife species are often lacking, or habitat types affected by surface-disturbing activities cannot be predicted.
- The health of fisheries within the Planning Area is directly related to the overall health and functional capabilities of riparian/wetland resources, which in turn reflect watershed health.
- Any activities that affect the ecological condition of the watershed and its vegetative cover could directly or indirectly affect the aquatic environment. The degree of impact attributed to any one disturbance or series of disturbances is influenced by location within the watershed, time and degree of disturbance, existing vegetation, and hydrologic condition.
- Actions impacting one species have similar impacts on other species using the same habitats or areas.

4.20.2 Impacts Common to All Alternatives

The following discussions represent impacts to wildlife and fisheries that would not vary by alternative.

Management to support air quality and the use of dust abatement measures could support vegetation by preventing dust accumulation on foliage, by reducing airborne pollutants or particulate matter that could damage vegetation, and reduce sediment accumulation in stream channels. The management would support forage for wildlife and water quality and habitat for fish.

Closing the Monticello WSR Segment 3 to mineral leasing (753 acres) would prevent surface disturbance from leasing activities, and protect adjacent riparian or upland habitat from degradation or damage as a result of erosion and runoff. The closure of future leasing activities would protect riparian and upland vegetation, reduce sedimentation and siltation of streambeds, and support water quality for fish habitat. The prevention of surface disturbance could reduce the potential for the introduction and spread of invasive, non-native plant species, providing additional protection to stream health and fish habitat. Wildlife that use

riparian, upland, and wetland habitat such as warbling vireo (*Vireo gilvus*), song sparrow (*Melospiza melodia*), and spotted towhee (*Piplo maculatus*) would benefit from the undisturbed habitat and forage, and from the reduced presence of humans and machinery associated with mineral leasing. Habitat for Colorado River fish such as bluehead sucker (*Catostomus discobolus*) and speckled dace (*Rhinichthys osculus*) would be protected through closing the river segment to future mineral development.

Raptor management requiring the use of *Best Management Practices for Raptors and Their Associated Habitats in Utah* would directly benefit raptor species such as red-tailed hawk (*Buteo jamaicensis*), Cooper's hawk (*Accipiter cooperii*), and sharp-shinned hawk (*Accipiter striatus*) and their habitat by reducing disturbing activities and human presence, which allows species to remain in desired habitat for hunting, nesting and reproduction. Maintaining and enhancing habitat for raptors would directly benefit those species by providing desired nesting and foraging habitat. Other wildlife species would also benefit from spatial buffers and habitat protection from reduced disturbance from humans and development activities, protecting cover, forage, and habitat corridors.

Applying TL stipulations for the Lockhart Desert bighorn sheep habitat (64,798 acres) regarding surface-disturbing activities or occupancy from April 1 through June 15 and from October 15 through December 15 would protect bighorn sheep (*Ovis canadensis nelsoni*) during sensitive lambing and rutting timeframes, would support the overall health of the species, and continued reproduction of the herd. The TL stipulation would also ensure forage and cover during the stipulated timeframes for bighorn sheep and other wildlife. Disturbance of bighorn sheep and wildlife would be prevented, allowing wildlife to remain in desired habitat and conserving energy that could be expended if humans or activity were present.

4.20.3 Impacts from Alternative A (No Action)

Applying an NSO stipulation for oil and gas leasing within the existing Three Rivers mineral withdrawal for locatable minerals could provide greater protection to fish and wildlife habitat within the withdrawal area by preventing damage or removal of wildlife cover and forage, reducing fragmentation of habitat, and could prevent disturbance of wildlife from future oil and gas leases within the 23,441 acres. The NSO stipulation could prevent soil loss, erosion, or sedimentation of spawning habitat; could prevent the loss or damage to in-stream, riparian, or upland habitat, and could prevent or reduce the introduction and spread of invasive, non-native plant species. The stipulation could provide protection to downstream habitat for fish such as speckled dace and bluehead sucker; waterfowl such as blue-winged teal (*Anas discors*), great blue heron (*Ardea herodias*), and green-winged teal (*Anas crecca*); big game, and other wetland and riparian wildlife species; and would support water quality within the Green River and Colorado River corridors.

Under Alternative A, oil and gas and potash leasing and development could occur concurrently within the same tract of land, which could result in higher concentrations of development and redundant infrastructure, including potash processing facilities. Any area where oil and gas, or potash leasing and development occurs would cause surface disturbance resulting in both short-term and long-term habitat loss, fragmented habitat, and the increased potential for the introduction and spread of invasive, non-native plant species; further degrading habitat conditions for wildlife. Direct habitat loss or degradation of habitat would force wildlife to relocate to other areas where competition for forage and other habitat resources would increase. Increased competition for resources could lead to decreased health and reproduction, and could result in increased predation or mortality.

Mineral development activities could disturb wildlife if development were to occur within occupied habitat, possibly causing species to vacate the area to lower quality habitat. Moving from desirable habitat could result in reduced health of animals, making them susceptible to disease or predation. As densities of wells, roads, and facilities increase, habitat within and near well fields become progressively less effective until

most animals no longer use these areas. Animals that remain within the affected zones are subjected to increased physiological stress. Where development occurs near sensitive habitat for big game, such as winter range or other limited habitat, the health of the populations can be impacted through reduced reproduction or by limiting the availability of valuable forage resources during sensitive timeframes (Sawyer 2002).

Construction of linear disturbances, such as pipelines and roadways associated with mineral development, would fragment wildlife habitat and these areas are vulnerable to the introduction and spread of invasive, non-native plant species. Vehicle use could result in the injury or mortality of wildlife species if collisions were to occur. Predatory wildlife (coyote, fox, and raptors) use road and pipeline corridors for hunting small prey species (mice, lizards, and snakes). The development of pipelines and roadways could be beneficial to the predators, but could increase predation on the smaller wildlife within the corridors. Runoff from development could lead to streambank erosion, vegetation loss, sedimentation of streambeds, and stream channel alteration; reducing the quality of habitat for fish and aquatic species.

In Alternative A, approximately 476 acres of vegetation and topsoil could initially be removed for oil and gas development in the next 15 years, which would result in direct loss of wildlife habitat, further degradation of surrounding habitat, fragmentation of habitat, and the disturbed areas would be vulnerable to the introduction and spread of noxious weeds, leading to additional loss of native vegetation resources. Over the long term, reclamation would occur and habitat could re-establish within 133 acres, leaving 343 acres of net surface disturbance within potential wildlife habitat. Reclaimed areas could provide new areas and seral stages of habitat for wildlife as revegetation efforts are completed.

Allowing oil and gas leasing on 210,884 acres subject to standard terms and conditions (open) would result in the damage or removal of wildlife habitat from the development of well pads and associated infrastructure. Invasive, non-native plant species could be introduced and spread by vehicles and machinery during development activities, which could change habitat composition and function, reducing forage quality and usable habitat for wildlife species. Runoff from development could lead to streambank erosion, vegetation loss, sedimentation of streambeds, and stream channel alteration; reducing the quality of habitat for aquatic species. The largest areas of vegetation within the open areas that could be developed includes blackbrush (76,635 acres), which contains habitat for mule deer (*Odocoileus heminonus*), pronghorn (*Antilocapra americana*), bighorn sheep, and kangaroo rat (*Dipodomys ordii*), and pinyon-juniper (64,731 acres) which contains habitat for Rocky Mountain elk (*Cervus canadensis*), black-throated gray warbler (*Dendroica nigrescens*), and pinyon jay (*Gymnorhinus cyanocephalus*) (USFS 2013, UDWR 2005b) (Table 4-55). Acres of habitat for big game species within the lands open for oil and gas development are shown in Table 4-67.

Applying CSU and TL stipulations in Alternative A to oil and gas leasing could reduce loss, damage, or degradation of wildlife habitat within 440,386 acres. The TLs would prevent surface disturbance during specific timeframes, which could protect big game or other wildlife during the periods of closure from disruption or disturbance from humans or machinery. Adjusting timing of disturbance could allow wildlife to remain in desired habitat during sensitive timeframes and within important habitat, such as winter range, a limiting factor in mule deer and other big game health. Disturbance, damage or loss of habitat could occur outside of the seasonal closures, ultimately leading to some loss of habitat from oil and gas development. The CSU stipulations could reduce disturbance to steep slopes, scenic driving corridors, and VRM Class II areas, minimizing surface disturbance, habitat loss or damage, erosion, runoff, and the introduction and spread of invasive, non-native plant species. The largest area of vegetation that is covered by the CSU and TL stipulations is pinyon-juniper, which provides habitat for big game, black bear (*Ursus americanus*), numerous Birds of Conservation Concern (BCC), and small mammals such as deer mouse (*Peromyscus maniculatus*), Uinta chipmunk (*Neotamias umbrinus*), and rock squirrel (*Spermophilus*

variegatus) (Gillihan 2006, UDWR 2005b). Deer, elk, pronghorn and bighorn sheep habitat would receive some reduction in surface disturbance or disruption from this management (Table 4-67).

Applying an NSO stipulation in Alternative A for oil and gas leasing would prevent surface-disturbing activities from oil and gas leasing development within the 133,374 acres. The NSO stipulation could protect wildlife habitat from damage, removal or degradation, reduce the presence of infrastructure, humans, and machinery, and reduce habitat fragmentation. Removing future disturbance from roads, structures, drilling operations, and human disturbance from mineral development could reduce a majority of stressors and disruption of habitat and could allow for continued habitat connectivity. The NSO could prevent future barriers in migration corridors for big game and other migratory wildlife species allowing wildlife to move between crucial winter ranges, parturition, breeding or nesting habitat, and would provide overall habitat protection. The prevention of surface disturbance would reduce the potential for the introduction and spread of invasive, non-native plant species, supporting intact habitat and desired forage and cover for wildlife. The largest area of habitat protected under the NSO stipulation would be pinyon-juniper (68,485 acres, Table 4-55) and bighorn sheep habitat would receive the largest area of protection (121,173 acres, Table 4-67). The NSO stipulation could prevent soil loss, erosion, or sedimentation of streambeds, and could support water quality and provide protection of habitat for fisheries and other aquatic species.

Closing 753 acres to oil and gas leasing would prevent damage or loss of wildlife habitat from development activities, reduce disturbance to wildlife from the presence of humans, vehicles or machinery, prevent erosion or runoff, and protect an intact ecosystem. The closed acres are adjacent to the Colorado River and would protect important habitat for fish species such as speckled dace, bluehead sucker, and fathead minnow; waterfowl such as blue-winged teal, great blue heron, and green-winged teal, big game, and other wetland and riparian wildlife species; and would support water quality within the Colorado River corridor. All of the 753 closed acres contain desert bighorn sheep habitat, which would be directly protected from damage and disturbance by oil and gas development (Table 4-67). Precluding oil and gas development would prevent the introduction and spread of invasive, non-native plant species from machinery and vehicles, further supporting desired forage, cover, and contiguous habitat. The largest area of vegetation type is pinyon-juniper (528 acres) followed by salt desert shrub (214 acres), which could also provide undisturbed habitat conditions for species such as long-nosed leopard lizard (*Gambelia wislizenii*), chukar (*Alectoris chukar*), or rock squirrel.

Table 4-67. Big Game Habitat within the Areas of Oil and Gas Leasing Management Category for All Alternatives

Management Category	Alternative A (acres)	Alternative B1 (acres)	Alternative B2 (acres)	Alternative C (acres)	Alternative D (acres)
Deer and Elk Habitat					
Open	18,909	0	0	0	0
CSU/TL	109,037	51,040	51,040	21,804	51,255
NSO	15,416	90,363	93,556	99,734	79,875
Closed	0	0	0	23,058	10,272
Pronghorn Habitat					
Open	70,029	0	0	0	0
CSU/TL	161,941	122,249	155,231	26,930	124,895
NSO	20,340	68,274	98,060	210,137	57,499
Closed	0	0	0	16,223	8,128

Management Category	Alternative A (acres)	Alternative B1 (acres)	Alternative B2 (acres)	Alternative C (acres)	Alternative D (acres)
Desert Bighorn Sheep Habitat					
Open	118,189	0	0	0	0
CSU/TL	121,274	68,176	106,578	65	67,517
NSO	121,173	229,671	256,893	270,787	169,250
Closed	753	753	753	93,373	61,834

In Alternative A, approximately 1,223 acres of vegetation could be removed for potash well drilling (production and non-production wells) in the next 15 years, which would result in direct loss of vegetation resources and topsoil, and could lead to the introduction and spread of invasive, non-native plant species. Over the long term, reclamation would occur and vegetation resources could re-establish within 408 acres, leaving only 815 acres of net surface disturbance within potential wildlife habitat.

Under Alternative A, impacts from potash well drilling would be the same as described for the areas managed for oil and gas leasing as open with standard terms and conditions, the application of lease stipulations of CSU, TL, and NSO, and closing lands to mineral development.

Potash processing facilities could be developed where existing stipulations do not preclude surface disturbance (NSO and closed). This means that potash processing facilities could be constructed in the 210,884 acres of open to leasing with standards terms and conditions (open) areas or possibly within the 440,386 acres of lands managed with CSU and TL stipulations. Development of processing facilities could result in the long-term removal of wildlife habitat on up to 3,716 acres for solar evaporation processing, or 500 acres for crystallization processing, and the loss of wildlife habitat would continue through the life of the Moab MLP. Development of processing facilities would result in the damage, degradation, or removal of wildlife habitat, fragmentation of habitat, and disturbance from humans, construction activities, or vehicle traffic. Direct habitat loss or degradation of habitat would force wildlife to relocate to other areas where competition for forage and other habitat resources would increase. Increased competition for resources could lead to decreased health and reproduction, and could result in increased predation or mortality. Invasive, non-native plant species could be introduced and spread by vehicles and machinery during operation of the facilities, which could change vegetation composition and function, making habitat inhospitable for native plant species and could lead to further losses of wildlife habitat.

Construction or operation of potash processing facilities could disturb wildlife if they were to occur within occupied habitat, possibly causing species to vacate the area to lower quality habitat. Moving from desirable habitat could result in reduced health of animals, making them susceptible to disease or predation. Where development occurs near sensitive habitat for big game, such as winter range or other limited habitat, the health of the populations can be impacted through reduced reproduction or by limiting the availability of valuable forage resources during sensitive timeframes (Sawyer 2002). Vehicle use could result in the injury or mortality of wildlife species if collisions were to occur. Predatory wildlife (coyote, fox, and raptors) could use road and pipelines for hunting small prey species (mice, lizards, and snakes). The presence of pipelines and roadways would be beneficial to the predators, but could increase predation on the smaller wildlife within the corridors. Runoff from development could lead to streambank erosion, vegetation loss, sedimentation of spawning habitat, and stream channel alteration; reducing the quality of habitat for fisheries and for aquatic or riparian species.

Applying a TL stipulation for mineral leasing (for both oil and gas and potash) prohibiting surface-disturbing activities on saline soils within 68,275 acres from December 1 to May 31 could reduce damage

or removal of wildlife habitat, reduce soil loss and erosion, and prevent saline runoff, which could damage sensitive fish or wildlife habitat. This stipulation would prevent disturbance to pronghorn during winter months within the protected area, which could reduce stress from disturbance or disruptions from human presence or vehicles.

Management for salinity control, sensitive soils, drought management, and applying BMPs to all oil and gas authorizations in accordance to WO IM 2007-021 and the most current version of the *Gold Book* could provide protection to wildlife habitat, reduce erosion and soil loss, prevent the establishment or spread of invasive, non-native plant species, and support reclamation and revegetation efforts. The BMPs would protect wildlife from hazards, prevent degradation of riparian and fish habitat, and could help reduce habitat fragmentation; supporting continued habitat function and value for fish and wildlife species where the BMPs and other management were applied.

Applying mineral leasing stipulations for steep slopes (Table 4-56) could reduce or prevent surface disturbance to wildlife habitat, protect vegetation and soils from damage or loss, and could prevent or reduce erosion. The stipulations would directly protect or minimize damage or loss of hillside and downslope vegetation and could prevent landslides and heavy erosion on slopes that could result in larger losses of wildlife habitat. Additional erosion control plans could reduce habitat damage or loss, soil loss, and runoff in areas where development occurs. Deer, elk, and bighorn sheep habitat would be protected by the NSO and CSU stipulations, which could minimize or prevent disturbance to forage, cover, and travel corridors.

BMPs for water quality could support the health of upland and riparian habitat and could provide continued availability of water resources for wildlife and could protect water quality for fish and aquatic wildlife species.

Applying an NSO stipulation within public water reserves, 100-year floodplains, within 330 feet of riparian areas and springs would protect 50,495 acres of wetland, riparian, and aquatic habitat for fish, macroinvertebrates, waterfowl and other species dependent on these ecosystems. The NSO could prevent runoff into aquatic systems, preventing siltation of spawning habitat, improving water quality, and preventing erosion of streambanks. Reducing runoff and erosion would protect riparian and other vegetation from damage or further soil loss and could reduce the potential for the introduction and spread of invasive, non-native plant species, providing additional protection to downstream habitat and corridor function. The stipulation would allow for undisturbed access to water sources, forage and cover for numerous wildlife species including elk, deer, song sparrow, Great Basin spadefoot, and numerous bat species.

Applying an NSO stipulation for mineral leasing to the suitable WSR segments along the Colorado and Green Rivers (with the exception of Colorado River Segment 3 in Monticello) (19,347 acres) could prevent surface disturbance from mineral leasing activities, and protect adjacent riparian or upland habitat from degradation or damage as a result of erosion and runoff. The closure to future leasing activities would protect habitat for fish, reduce sedimentation and siltation of streambeds, and support water quality. The prevention of surface disturbance could reduce the potential for the introduction and spread of invasive, non-native plant species, providing additional protection to stream health and fish habitat. Wildlife that use riparian, upland, and wetland habitat such as warbling vireo, song sparrow, and spotted towhee would benefit from the undisturbed habitat and forage, and from the reduced presence of humans and machinery associated with mineral development.

Avoiding or minimizing loss of sagebrush steppe habitat on a case-by-case basis would help ensure contiguous habitat and reduced disturbance of wildlife within this vegetation community, as well as prevention of direct habitat loss or degradation. Where this management is applied, wildlife such as mule deer and Brewer's sparrow (*Spizella breweri*) would benefit from intact habitat and reduced disturbance

from development. Where mineral development in sagebrush results in reclamation, habitat for sagebrush species could be mitigated over the long-term; revegetation of sagebrush habitat may take anywhere between 10-50 years to establish and mature, depending on soils, climate, and rainfall. The initial mitigation projects could displace wildlife species from human and vehicle presence, causing wildlife to flee to other, possibly lower quality habitat. Displacement could cause short term impacts to wildlife from stress from fleeing or from inadequate forage, shelter or breeding habitat.

The use of native seed mixes on a case-by-case basis for restoration and rehabilitation would support the growth of native vegetation communities that would provide preferred forage, cover and habitat for wildlife when areas have been rehabilitated. Areas that restore with native plant composition provide habitat and cover for wildlife species and could support healthy wildlife populations. Use of non-native species could help stabilize soils, prevent erosion, and reduce the establishment and spread of invasive or noxious plant species in the short-term. Over the long-term, non-native species could provide stable lands for native species to then re-establish and provide suitable habitat for wildlife. Preventing the infestation and spread of noxious weeds or controlling noxious weed species on a case-by-case basis would support the health and vitality of native habitat for wildlife and help to reduce competition with native plant species for soil, water and solar resources; allowing native plant species to thrive and provide intact habitat for wildlife.

Applying a TL stipulation pronghorn fawning habitat that would preclude surface-disturbing activities from May 1 to June 15 (99,744 acres) would directly protect pronghorn from disturbance by human activity, vehicles, and mineral development activities during the sensitive fawning timeframe. Forage and cover would remain intact and available for pronghorn and other wildlife species within the 45 days; however, surface disturbance, habitat damage or loss could occur during the remainder of the year, which could result in loss of important fawning habitat and habitat fragmentation. Pronghorn could abandon lands where mineral development does occur, which could result in reduced reproduction and loss of animals if suitable habitat was not available for pronghorn to relocate.

Applying an NSO stipulation for the Potash-Confluence desert bighorn sheep herd to protect lambing, rutting, and migration habitat for mineral leasing would directly protect bighorn sheep during sensitive breeding and lambing periods (101,461 acres), as well as by protecting this habitat throughout the year. The NSO stipulation could protect bighorn sheep and other wildlife by reducing human presence, vehicle use, and development activity, which would prevent species dispersal to other less desirable habitat. Forage, cover, and corridors for travel and migration could be protected, and habitat fragmentation would be prevented within the protected area. In addition, the NSO stipulation could prevent runoff into aquatic habitat, support water quality, and protect streambeds and spawning habitat from sedimentation or erosion. An exception allowing pipeline construction and geophysical exploration within migration corridors outside of lambing and rutting periods would still provide reduced disturbance from human presence, vehicles, and development activities during the sensitive breeding and lambing periods; however, allowing development of pipelines within migration corridors could disrupt movement of bighorn sheep or other wildlife where pipelines are placed. An exception that allows geophysical exploration could disrupt movement of bighorn sheep and other wildlife. Both activities would cause habitat loss, damage to habitat, and habitat fragmentation, which could force bighorn sheep and other wildlife to use lower quality, less desirable habitat for migration, forage, or cover.

Applying a TL stipulation to preclude surface-disturbing activities within deer and elk winter and fawning habitat (90,901 acres) would directly protect elk and deer from disturbance by human activity, vehicles, and mineral development activities during the specific timeframes. Forage and cover would remain intact and available for elk, deer, and other wildlife species within the TL stipulations; however, surface disturbance, habitat damage or loss could occur during the remainder of the year, which could result in loss of important fawning or winter habitat and habitat fragmentation. Winter habitat is often a limiting factor in the success of mule deer herds; whereas fawning habitat for elk is often a limiting factor (UDWR 2008,

2010). Wildlife could abandon lands where mineral development does occur, which could result in reduced reproduction and loss of animals if suitable habitat was not available for deer, elk or other wildlife species to relocate.

4.20.4 Impacts from Alternative B

Applying an NSO stipulation up to 0.5 mile radius for cultural sites (22,328 acres) would directly protect 17,276 acres of bighorn sheep habitat, as well as habitat for raptors and other wildlife species within these areas. The NSO stipulation could prevent damage or removal of wildlife cover and forage, reduce fragmentation of habitat, and prevent disturbance of wildlife or raptors within the 0.5 mile radius. Applying an NSO stipulation could prevent runoff into aquatic habitat, support water quality, protect streambeds from sedimentation, and erosion of streambanks. Specific cultural sites were not addressed in Alternative A.

Impacts to fish and wildlife habitat from applying an NSO stipulation for the Three Rivers mineral withdrawal would be the same as described in Alternative A.

Under Alternative B, maximizing oil and gas lease size and applying the Baseline CSU stipulation to sensitive resources would result in reducing or eliminating redundant infrastructure from oil and gas development. This in turn could reduce loss, damage, or degradation of wildlife habitat, which could allow for more contiguous wildlife habitat. More consolidated mineral related infrastructure could reduce barriers to migration and other travel corridors for wildlife. Less surface disturbance could provide higher quality habitat for wildlife compared to Alternative A, where this management is not applied. Reducing surface disturbance could reduce the potential for the introduction and spread of invasive, non-native plant species, further protecting the quality and availability of suitable wildlife habitat.

Applying the Baseline CSU stipulation for all mineral development, 208,185 acres in Alternative B1 and 222,289 acres in Alternative B2, could reduce surface disturbance when compared to Alternative A, which primarily consists of timing restrictions for wildlife species. The Baseline CSU stipulation could reduce or minimize surface disturbance, reduce removal or degradation of wildlife habitat, provide additional protections for wildlife habitat, and could provide offsite reclamation for areas that are developed. Minimizing density of development could allow for fewer barriers of movement for wildlife species from well pads and other infrastructure, and could reduce fragmentation of habitat. Less fragmented habitat could protect wildlife from human and other disturbance and could provide larger areas for wildlife to breed, migrate, forage, seek cover, and complete their life histories as compared to Alternative A. The Baseline CSU stipulation could reduce soil erosion and runoff into nearby riparian areas, leading to less sedimentation of spawning habitat, and could maintain or improve water quality for fish and aquatic species.

Applying BMPs, as appropriate, to mineral operations (oil and gas and potash) would provide greater protection to wildlife habitat and wildlife as compared to Alternative A. The BMPs would provide support for big game and other wildlife habitat that would minimize impacts through project design or mitigation. The BMPs include reclamation and restoration requirements, including greater management for seeding and control of noxious weeds as compared to Alternative A, and could allow for revegetation of native vegetation communities as development activities are completed, which would support overall ecosystem health and provide a variety of seral stages of vegetation for big game and other wildlife species. BMPs for noise could further reduce disturbance to wildlife and could prevent some wildlife from abandoning habitat due sound levels from development activity or operations.

Applying a CSU stipulation for mineral leasing for offsite reclamation for areas of saline soils could provide soil stability and help reduce vegetation loss, soil erosion, and runoff if reclamation efforts were successful. Applying a CSU stipulation for mineral leasing on steep slopes over 21 percent (Table 4-56) and avoiding development, where possible, could reduce or prevent surface disturbance to wildlife habitat, protect

vegetation and soils from damage or loss, and could prevent or reduce erosion into stream channels. The stipulations would directly protect or minimize damage or loss of hillside and downslope vegetation; and could prevent landslides and heavy erosion on slopes, thereby reducing larger losses of wildlife habitat. These CSU stipulations could protect wildlife habitat to a greater degree as compared to Alternative A. Preventing or reducing erosion, soil loss and runoff would reduce sedimentation of spawning gravel, and would protect in-stream habitat from reduced water quality and channel degradation. Additional erosion control plans could reduce habitat damage or loss, soil loss, and runoff in areas where development occurs.

Applying an NSO stipulation to preclude mineral activities within public water reserves, 100-year floodplains and within 500 feet of intermittent and perennial streams, rivers, riparian areas, wetlands, water wells, lakes, springs (69,786 acres) and 750 foot buffers on the Colorado River and Fisher Creek (4,590 acres) provides greater protection for wildlife habitat as compared to Alternative A with larger buffer distances (170 feet larger) and additional acreage (23,881 more acres). Impacts to wildlife and fish habitat would be similar to Alternative A; however, the larger area of protection would allow for greater protection of aquatic, riparian, wetland, upland and fisheries habitat; greater access to water sources for wildlife, less disturbance or disruption of wildlife from mineral development, and access to uninterrupted, contiguous habitat for wildlife movement or migration.

Measures to protect water quality in aquifers and watersheds from mineral development include: 1) applying a CSU stipulation to important spring areas requiring a hydrologic assessment prior to conducting any mineral operations (38,056 acres), 2) applying the Baseline CSU stipulation to the Courthouse Wash Watershed (51,790 acres) and applying a CSU stipulation requiring closed loop drilling to this watershed, 3) applying the Baseline CSU stipulation along with a CSU stipulation requiring the use of closed loop drilling and other operational constraints to the Salt Wash Watershed (61,925 acres), and 4) applying BMPs for the protection of shallow and potential unconsolidated aquifers. This management could protect aquatic wildlife and fish habitat and provide clean water sources for wildlife use. Alternative A does not address these water resources.

Impacts to wildlife and fish from applying an NSO stipulation to the suitable WSR segments along the Colorado and Green Rivers would be the same as those described in Alternative A.

Impacts to deer, elk and other wildlife from applying a TL stipulation for surface-disturbing activities from mineral development would be similar to those described under Alternative A, but a larger area of crucial winter habitat would be protected, 43,448 more acres as compared to Alternative A. Crucial winter range is a limiting factor to most wildlife, including mule deer; the larger area of seasonally protected habitat would support the health and survival of mule deer, elk and other wildlife during the critical winter months. Protections from the Baseline CSU would provide additional protection for winter range for mule deer, elk, bighorn sheep, and other wildlife by minimizing density of development and locating development in areas of lower quality habitat. Minimizing density of development could allow for fewer barriers of movement for wildlife species from well pads and other infrastructure, and could reduce fragmentation of habitat. Less fragmented habitat could protect wildlife from human and other disturbance and could provide larger areas for wildlife to breed, migrate, forage, seek cover, and complete their life histories.

Impacts Specific to Alternative B1 Only

Not issuing oil and gas leases within PLAs (103,619 acres) could reduce the concentration of development and redundant infrastructure resulting in less damage or removal of vegetation, which could allow for more contiguous wildlife habitat, and would create fewer disturbed areas of lost or damaged habitat. However, 43 percent of the Hatch Point PLA contains existing oil and gas leases. Therefore, there is potential for concurrent development of oil and gas and potash on these existing leases and a greater likelihood for adverse impacts to wildlife in the Hatch Point PLA. The reduction of surface disturbance could reduce the

potential for the introduction and spread of invasive, non-native plant species, supporting intact habitat and desired forage and cover for wildlife. Reducing the level of development within PLAs could reduce runoff into aquatic systems, preventing siltation of spawning habitat, improving water quality, and preventing erosion of streambanks. Reducing runoff and erosion would protect riparian and other vegetation from damage or further soil loss and could reduce the potential for the introduction and spread of invasive, non-native plant species, providing additional protection to fisheries, downstream habitat, and corridor function. Less surface disturbance could provide higher quality habitat for wildlife compared to Alternative A, where this management is not applied.

The development of potash leases in the PLAs could diminish wildlife habitat. Furthermore, if potash resources do not develop in 10 years, the area could again be available for oil and gas leasing. If the acreage encompassed by PLAs were to become available solely for oil and gas leasing and development the adverse impacts to wildlife would be similar to or less than the impacts identified for potash leasing and development. Alternative B1 does not allow potash leasing on 681,948 acres within the Planning Area, which would minimize adverse impacts to wildlife from concurrent oil and gas and potash development, including potash processing facilities, as compared to Alternative A.

A phased approach to potash leasing could help reduce impacts to wildlife as compared to Alternative A. By testing the feasibility of potash development, unnecessary surface disturbance would be avoided and appropriate mitigation measures applied. These measures could benefit wildlife.

Applying a CSU stipulation to all potash leases that requires processing facilities to be located within a PPFA within 42,492 acres would localize the disturbance and infrastructure to the PPFAs and prevent large-scale disturbance and habitat loss from potash processing in other areas in the Planning Area. In Alternative A, potash processing facilities could occur anywhere within 210,884 acres of open areas and possibly 440,386 acres of lands with CSU and TL stipulations. Limiting the area available for PPFAs in Alternative B1 could reduce the overall loss of habitat by preventing the location of facilities outside of the PPFAs in more sensitive wildlife habitat. In addition, limiting the area available for PPFAs in Alternative B1 would reduce the amount of surface disturbance (from 4,216 acres to 3,037 acres) associated with processing facilities as compared to Alternative A. Table 4-57 shows the types of vegetation within the proposed PPFAs and Table 4-68 shows the acres of big game habitat within the PPFAs. NSO stipulations within the PPFAs for ephemeral drainages would protect a total 2,528 acres of habitat and forage from damage or removal; and the largest area of habitat protected with an NSO stipulation would be for pronghorn (2,416 acres) followed by deer and elk and then bighorn sheep. The CSU stipulation areas would allow for controlled development, with the greatest possible losses of vegetation types being within salt desert shrub (21,566 acres) and sagebrush (8,075 acres). Habitat for pronghorn has the greatest area of overlap with the CSU stipulation areas within the PPFAs lands (38,726 acres), with much smaller areas of habitat for bighorn sheep (9,133 acres) and 1,484 acres of deer and elk habitat. The CSU stipulations would mitigate sensitive habitat for big game, so although there would be surface disturbance from the construction of processing facilities within the PPFAs, efforts would be made to mitigate important habitat.

Table 4-68. Big Game Habitat within the Potash Processing Facility Areas for Alternatives B1 and D (only)

Management Stipulation	PPFA Alternative B1 (acres)	PPFA Alternative D (acres)
Deer and Elk Habitat		
CSU/TL	1,484	1,484
NSO	146	146

Management Stipulation	PPFA Alternative B1 (acres)	PPFA Alternative D (acres)
Pronghorn Habitat		
CSU/TL	38,726	38,720
NSO	2,416	2,422
Desert Bighorn Sheep Habitat		
CSU/TL	9,133	9,133
NSO	420	420

In Alternative B1, approximately 312 acres of vegetation and topsoil could initially be removed for oil and gas development in the next 15 years, which would result in direct loss of wildlife habitat, further degradation of surrounding habitat, fragmentation of habitat, and disturbed areas would be vulnerable to the introduction and spread of noxious weeds, leading to additional loss of native vegetation resources. Over the long term, reclamation would occur and habitat could re-establish within 87 acres, leaving 225 acres of net surface disturbance within potential wildlife habitat (118 fewer acres than Alternative A). Reclaimed areas could provide new areas and seral stages of habitat for wildlife as revegetation efforts are completed.

Under Alternative B1, there are zero acres managed as open to oil and gas and potash leasing with standard terms and conditions as compared with the 210,884 acres that are open subject to standard terms and conditions under Alternative A. Therefore, Alternative B1 could result in the less damage or removal of wildlife habitat as compared to Alternative A.

Applying CSU and TL stipulations to oil and gas leasing could reduce damage or loss of vegetation and habitat for wildlife within 228,926 acres. Applying CSU stipulations, which includes the Baseline CSU stipulation, could minimize density of disturbance, reduce conflicts of development, and support reclamation and mitigation activities when development does occur. These CSU stipulations could reduce or minimize surface disturbance, reduce removal or degradation of wildlife habitat, provide additional protections for wildlife habitat, and could provide offsite reclamation for areas that are developed. Minimizing density of development could allow for fewer barriers of movement for wildlife species from well pads and other infrastructure, and could reduce fragmentation of habitat. Reducing habitat fragmentation could protect wildlife from human and other disturbance and could provide larger areas for wildlife to breed, migrate, forage, seek cover, and complete their life histories. This would provide additional levels of protection for wildlife and fish habitat as compared to Alternative A. The CSU stipulations could reduce soil erosion and runoff into nearby riparian areas, leading to less sedimentation of spawning habitat, and could maintain or improve water quality for fish and aquatic species. Impacts to wildlife from TL stipulations would be the same as those described under Alternative A.

Applying an NSO stipulation for oil and gas leasing would prevent surface-disturbing activities from oil and gas development within 452,269 acres, 318,695 more acres as compared to Alternative A. Impacts to wildlife and fish habitat would be similar to Alternative A; however a much larger area of land would be protected from surface-disturbing activities from oil and gas development. The NSO stipulation would protect larger areas of habitat for deer, elk, pronghorn and bighorn sheep as compared to Alternative A (Table 4-67). Vegetation types that provide habitat for big game as well as other wildlife species would have larger areas of protection under the NSO stipulation: 82,334 more acres of blackbrush habitat, 138,265 more acres of pinyon-juniper, and 46,574 more acres of salt desert shrub would be protected compared to Alternative A. Wildlife species such as kangaroo rat, bighorn sheep, juniper titmouse (*Baeolophus*

ridgwayi), elk, bobcat (*Lynx rufus*), and pronghorn occupy these three habitat types protected within lands managed with an NSO stipulation (USFS 2013, UDWR 2005b, Blaisdell and Holmgren 1984).

Impacts to wildlife and fish habitat from closing 753 acres to oil and gas leasing would be the same as those described under Alternative A.

Potash leasing would only be permitted within the PLAs (103,619 acres), with 57,620 of these acres available for potash leasing with CSU and TL stipulations, and the remaining 45,999 acres available with NSO stipulations. Table 4-69 shows the acres of big game habitat within the NSO and CSU stipulations. Overlap of habitat is greatest for bighorn sheep and pronghorn, and development could occur within the CSU acres, subject to the leasing stipulations. Impacts to wildlife habitat from potash leasing and well drilling would be similar to impacts from oil and gas leasing and well drilling described above. Projected potash well drilling in Alternative A amounts to 1,223 acres of surface disturbance and the projected potash well drilling in Alternative B1 amounts to 647 acres of surface disturbance. Therefore, the potential impacts to wildlife resources are less in Alternative B1 than Alternative A.

Table 4-69. Big Game Habitat by Potash Leasing Stipulation within the Potash Leasing Areas for Alternatives B1 and D (only)

Leasing Stipulation	PLA Alternative B1 (acres)	PLA Alternative D (acres)
Deer and Elk Habitat		
CSU	0	0
NSO	3,193	3,193
Pronghorn Habitat		
CSU	32,983	32,983
NSO	29,785	29,785
Desert Bighorn Sheep Habitat		
CSU	38,402	38,812
NSO	27,222	26,812

Under Alternative B1, approximately 681,948 acres are deferred for potash leasing and development as compared to Alternative A where 651,240 acres are available as open with standard terms and conditions and with minor constraints (CSU and TL stipulations). Therefore, Alternative B1 provides far less acreage for potash development than Alternative A. The area deferred for potash leasing in Alternative B1 would prevent damage or loss of wildlife habitat from potash development outside of the PLAs, reduce disturbance to wildlife from the presence of humans, vehicles or machinery, reduce erosion or runoff, and support an intact ecosystem. Oil and gas development would still occur within those areas deferred for potash leasing, but there would be less density of disturbance from overlapping development and infrastructure. Reduction in surface disturbance could reduce soil loss, erosion, or sedimentation of streambeds, and could support water quality and provide protection of habitat for fisheries and other aquatic species.

Under Alternative B1, the TL stipulation for mineral leasing to prohibit surface-disturbing activities on saline soils would only apply within 49,915 acres as compared to 68,275 acres in Alternative A. The TL stipulation would not apply within the PPFAs in Alternative B1, which could result in habitat damage or removal, erosion, and runoff of saline soils into nearby riparian areas which could affect water quality, fish habitat, and streambed conditions. However, an additional CSU stipulation within the PPFAs would require offsite mitigation of any disturbance of saline soils within these areas (18,360 acres) and sagebrush-steppe

(8,781 acres) thus offsetting the impacts to saline soils within the PPFAs. Offsite mitigation could eventually provide soil stability, reduced erosion, improve sagebrush steppe habitat, and new seral stages of habitat for wildlife such as pronghorn where rehabilitation efforts are successful.

Minimizing impacts to sagebrush steppe habitat in areas of moderately high to very high ecological intactness through the Baseline CSU stipulation could reduce damage or loss of sagebrush steppe habitat to a greater degree and with more consistency than Alternative A (11,269 acres). As part of the Baseline CSU stipulation, offsite mitigation could support new areas of sagebrush steppe habitat if regeneration were successful; however revegetation for this vegetation community can take 10 to 50 years depending on climate, soil quality, and other factors. An additional CSU stipulation under Alternative B1 for PPFAs (8,129 acres of sagebrush) could offset some losses of sagebrush steppe habitat from development of processing facilities through additional offsite mitigation and could provide future sources of habitat and forage over the long-term if revegetation efforts are successful. Minimizing loss of sagebrush steppe and mitigation efforts could continue to regenerate sagebrush steppe habitat for wildlife species such as sage sparrow (*Amphispiza belli*), Brewer's sparrow, and mule deer within the Planning Area as revegetation efforts are completed.

Impacts to pronghorn and other wildlife habitat from applying a TL stipulation to pronghorn fawning habitat would be the same as described under Alternative A; however, the stipulation would apply to fewer acres (85,639 acres; 14,105 fewer acres than Alternative A) within the PPFAs. Offsite mitigation would be required for habitat that is disturbed or removed within the PPFAs, which could eventually provide new habitat, habitat improvements, or water developments for pronghorn. Losses of habitat would affect pronghorn until restoration or habitat improvements were completed. Habitat loss and fragmentation could cause pronghorn to abandon lands where development does occur, which could result in reduced reproduction or mortality of animals if suitable habitat was not available for pronghorn to relocate.

Applying a CSU for mineral leasing in Alternative B1 to the Potash-Confluence bighorn sheep habitat (107,220 acres) would directly protect bighorn sheep lambing and rutting habitat from drilling operations and permanent facilities within those areas. Although Alternative A uses an NSO, the CSU management applies the same management and impacts to bighorn sheep would be similar to those described under Alternative A. Impacts to bighorn sheep and other wildlife from exceptions for pipelines, roads and geophysical exploration would be the same as those described in Alternative A. An additional CSU stipulation for offsite mitigation within PPFAs for habitat that is disturbed or removed within the PPFAs, which could eventually provide new habitat, habitat improvements, or water developments for bighorn sheep. Losses of habitat would affect bighorn sheep until restoration or habitat improvements were completed. Habitat loss and fragmentation could cause bighorn sheep to abandon lands where mineral development does occur, which could result in reduced reproduction or mortality of animals if suitable habitat was not available for bighorn sheep to relocate.

Impacts Specific to Alternative B2 Only

In Alternative B2, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would reduce impacts to wildlife that would result from the concurrent development of oil and gas and potash as described in Alternative A. The impacts to wildlife from the limited potash development provided in Alternative B1 would be greater than the exclusion of potash development in Alterative B2.

Alternative B2 would substitute oil and gas well drilling for potash well drilling within the PLAs established in Alternative B1 and the impacts to wildlife resources would be similar. The major difference between Alternative B1 and Alternative B2 is that Alternative B2 eliminates the 3,037 acres of surface disturbance,

and the associated potential adverse impacts to wildlife resources that could result from the construction of potash processing facilities within the 42,492 acres of PPFAs established in Alternative B1.

Managing the entire Planning Area as open only for oil and gas leasing (closed to potash leasing) would prevent damage or loss of wildlife habitat from potash leasing and development and could reduce disturbance to wildlife from the presence of humans, vehicles or machinery, reduce erosion or runoff, and could help reduce habitat fragmentation from potash drilling operations, processing facilities and associated infrastructure. The reduction of habitat loss or disturbance could reduce displacement of wildlife, allow for more contiguous habitat for migration or movement, and prevent openings in habitat where invasive, non-native species could establish, spread and cause further losses of habitat and habitat function. Oil and gas development would still occur within these acres, but there would be less density of disturbance from overlapping oil and gas and potash development and infrastructure. Reduction in surface disturbance could reduce soil loss, erosion, or sedimentation of streambeds, and could support water quality and provide protection of habitat for fisheries and other aquatic species.

In Alternative B2, approximately 385 acres of habitat, vegetation, and topsoil could initially be removed for oil and gas development in the next 15 years, which would result in direct loss of wildlife habitat, further degradation of surrounding habitat, fragmentation of habitat, and disturbed areas would be vulnerable to the introduction and spread of noxious weeds, leading to additional loss of native vegetation resources. Over the long term, reclamation would occur and habitat could re-establish within 108 acres, leaving only 277 acres of net surface disturbance in potential wildlife habitat (66 fewer acres than Alternative A). Reclaimed areas could provide new areas and seral stages of habitat for wildlife as restoration efforts are completed.

Under Alternative B2, there are zero acres open to oil and gas leasing with standard terms and conditions as compared to 210,884 in Alternative A. Therefore, Alternative B2 could result in less damage or removal of wildlife and fish habitat as compared to Alternative A.

Applying CSU and TL stipulations to oil and gas leasing would have the same impacts to wildlife and fish habitat as those described in Alternative B1.

Applying an NSO stipulation for oil and gas leasing in Alternative B2 would prevent surface development within 499,008 acres, 365,434 more acres as compared to Alternative A and a similar amount of acreage as compared to Alternative B1. Impacts to wildlife and fish habitat would be the same as those described under Alternative B1 and less than those described under Alternative A.

In Alternative B2, impacts to wildlife and fish habitat from closing 753 acres to mineral leasing would be the same as those described under Alternative A.

Impacts to wildlife habitat from applying a TL stipulation in Alternative B2 to saline soils would be the same as those described in Alternative A and less than those described in Alternative B1.

Minimizing impacts to sagebrush steppe through a CSU stipulation in Alternative B2 could reduce loss of sagebrush steppe vegetation to a greater degree than Alternative A. Impacts to wildlife habitat would be the same as described under Alternative B1.

Impacts to pronghorn and other wildlife habitat from applying a TL stipulation in Alternative B2 for surface-disturbing activities would be the same as Alternative A. The BMPs would provide support for big game and other wildlife habitat that would minimize impacts to sensitive habitat through project design or mitigation. BMPs could prevent habitat loss within sensitive habitat areas or could provide regeneration of

new habitat where habitat is lost, providing additional protection to pronghorn as compared to Alternative A.

Impacts to bighorn sheep from applying a CSU stipulation in Alternative B2 would be the same as Alternative B1; however, the additional CSU stipulation for offsite mitigation within PPFAs would not apply because the Planning Area is closed to potash leasing under this alternative.

4.20.5 Impacts from Alternative C

In Alternative C, the entire Planning Area would be open only for oil and gas leasing subject to the appropriate leasing stipulations. The Planning Area (785,567 acres) would be closed to potash leasing, which would result in the same impacts to wildlife as those described in Alternative B2.

Applying an NSO stipulation to oil and gas leasing for up to 1 mile radius for cultural sites (45,289 acres) in Alternative C would directly protect 34,305 acres of bighorn sheep habitat, as well as habitat for raptors and other wildlife species within these areas. This NSO stipulation would preclude surface disturbance on 17,029 more acres of bighorn sheep habitat than that which is protected for cultural sites in Alternative B. The NSO stipulation could prevent damage or removal of wildlife cover and forage, reduce fragmentation of habitat, and prevent disturbance of wildlife within the 1 mile radius. Applying an NSO stipulation could prevent runoff into aquatic habitat, support water quality, protect streambeds from sedimentation, and erosion of streambanks.

Closing the existing Three Rivers mineral withdrawal to oil and gas leasing in Alternative C would prevent future disturbance or damage to wildlife and fish habitat within and adjacent to the 23,441 acres from oil and gas development and would provide greater habitat protection than Alternatives A and B. The closure would provide greater protection to wildlife and fish habitat because it could limit development from adjacent lands. The closure would protect wildlife habitat from fragmentation, provide undisturbed corridors for migration, and prevent disturbance to wildlife from human presence and development activities. This management would prevent soil loss, erosion, or sedimentation of spawning habitat, prevent the loss or damage to in-stream, riparian or upland habitat, and would prevent or reduce the introduction and spread of invasive, non-native plant species. The closure would provide protection to habitat for fish such as speckled dace, bluehead sucker, and fathead minnow; waterfowl such as blue-winged teal, great blue heron, and green-winged teal; big game, and other wetland and riparian wildlife species, and would support water quality within the Green River and Colorado River corridor.

In Alternative C, impacts to wildlife and fish habitat from maximizing lease size and thus reducing or eliminating redundant infrastructure from oil and gas development would be the same as those described in Alternative B.

Applying the Baseline CSU stipulation for oil and gas leasing and development could reduce surface disturbance when compared to Alternative A. Impacts to wildlife and fish habitat would be similar to those described in Alternatives B1 and B2.

In Alternative C, approximately 74 acres of vegetation and topsoil could initially be removed for oil and gas development in the next 15 years, which would result in direct loss of wildlife habitat, further degradation of surrounding habitat, fragmentation of habitat, and disturbed areas would be vulnerable to the introduction and spread of noxious weeds, leading to additional loss of native vegetation resources. Over the long term, reclamation would occur and habitat could re-establish within 21 acres, leaving only 53 acres of net surface disturbance in potential wildlife habitat (290 fewer acres than Alternative A). Reclaimed areas could provide new vegetation and seral stages of habitat for wildlife as revegetation efforts are completed.

Under Alternative C, as in Alternatives B1 and B2, there are zero acres open to oil and gas and potash leasing with standard terms and conditions as compared with the 210,884 acres in Alternative A. Therefore, Alternative C could result in the less damage or removal of wildlife and fish habitat as compared to Alternative A.

Alternative C applies CSU and TL stipulations to oil and gas leasing on 54,799 acres which is much less acreage than Alternatives A and B. While Alternative C has fewer acres that are managed with a CSU or TL stipulation, these acres are managed more restrictively (NSO and closed). Thus, Alternative C provides more protection to wildlife and fish habitat than do Alternatives A and B. There would be habitat for deer and elk (21,804 acres) and pronghorn (26,930 acres) managed under CSU and TL stipulations, although very little bighorn sheep habitat (65 acres) would be managed with CSU and TL stipulations under this alternative (due to the increase of NSO management for bighorn sheep).

Applying an NSO stipulation for mineral leasing in Alternative C would prevent surface-disturbing activities from oil and gas development on 550,599 acres, which is 412,496 more acres as compared to Alternative A, and 51,511 acres more than Alternatives B1 and B2. Impacts would be similar to those described under Alternatives A, B1, and B2 but would apply to a much larger area, allowing for greater habitat connectivity for wildlife breeding, nesting, passage, and migration; reductions in disturbance from human presence, mineral development activities, and vehicles; and overall protection of sensitive habitat for big game and wildlife. In Alternative C, pinyon-juniper would receive the largest area of protection from the NSO stipulation (223,391 acres, Table 4-61), which provides habitat for species such as nightsnake (*Hypsiglena torquata*), Clark's nutcracker (*Nucifraga columbiana*), and black bear (Gillihan 2006). Blackbrush habitat would also receive greater protection than Alternative A (98,003 more acres, 133,438 total acres) providing wildlife such as kangaroo rat and bighorn sheep, with greater continuity of habitat, reduced conflicts with vehicles and humans, and less damage or disturbance of habitat from mineral leasing activities (USFS 2013). The largest areas of big game habitat are protected under this alternative: 99,734 acres of mule deer and elk habitat; 210,137 acres of pronghorn habitat; and 270,787 acres of bighorn sheep habitat (Table 4-67).

Under Alternative C, closing 180,169 acres to oil and gas leasing and development would preclude surface disturbance on 179,416 more acres of wildlife habitat compared to Alternatives A, B1, and B2. Impacts would be similar to those described under Alternative A, but would apply to far more acres of wildlife and fish habitat. The largest plant communities that provide habitat for wildlife that would be closed in Alternative C include pinyon-juniper (77,728 acres, 77,200 acres more than Alternative A) and blackbrush (53,109 acres, 53,067 acres more than Alternative A), which would provide undisturbed habitat for pronghorn (16,223 acres), mule deer/elk (23,058 acres), bighorn sheep (93,373 acres), black bear, cougar (*Felis concolor*), and numerous raptor species (Table 4-61 and Table 4-67).

In Alternative C, impacts to wildlife and fish habitat from applying a TL stipulation to saline soils would be the same as those described in Alternatives A and B.

In Alternative C, impacts to wildlife and fish habitat from applying a CSU stipulation for offsite reclamation for areas of saline soils would be the same as those described in Alternative B. There is no requirement for offsite reclamation in Alternative A.

Applying a CSU stipulation in Alternative C on slopes between 21 percent and 30 percent (Table 4-56) and avoiding development, where possible, could reduce or prevent surface disturbance to wildlife habitat, protect vegetation and soils from damage or loss, and could prevent or reduce erosion. The stipulations could minimize damage or loss of hillside and downslope habitat and could prevent landslides and heavy erosion on slopes thereby reducing larger losses of wildlife habitat (46,525 acres). Erosion control plans could reduce vegetation damage or loss, soil loss, and runoff in areas where development occurs. Applying

an NSO stipulation in Alternative C to slopes over 30 percent would provide direct protection of wildlife habitat from damage or removal in areas with potential for heavy runoff and erosion when disturbed (134,594 acres). Deer, elk, and bighorn sheep habitat would be protected by the NSO and CSU stipulations, which could minimize or prevent disturbance to forage, cover, and travel corridors. Preventing or reducing erosion, soil loss and runoff would reduce sedimentation of spawning gravel, and would protect in-stream habitat from reduced water quality, support fish habitat, and prevent channel degradation. These stipulations provide more protection for wildlife habitat located along steep slopes than is provided in Alternatives A and B because Alternative C provides an NSO stipulation to slopes greater than 30 percent.

Applying an NSO stipulation to preclude mineral activities within public water reserves, 100-year floodplains and within 650 feet of intermittent and perennial streams, rivers, riparian areas, wetlands, water wells, lakes, and springs (91,558 acres) provides greater protection for fish and wildlife habitat as compared to Alternatives A and B, with larger buffer distances and more acreage protected. Alternative C protects 41,063 more acres than Alternative A and 21,772 more acres than Alternative B. Impacts to wildlife and fish habitat would be similar to those described in Alternative A; however, the larger area of protection would allow for greater protection of aquatic, riparian, wetland, upland and fish habitat; greater access to water sources for wildlife, less disturbance or disruption of wildlife from mineral development, and access to uninterrupted, contiguous habitat for wildlife movement or migration.

Applying an NSO stipulation for impaired water bodies to preclude mineral activities within 1,000 feet of the Colorado River and Fisher Creek (6,883 acres) would allow for additional protection of wetland, riparian, aquatic, and fish habitat within or adjacent to these areas, 2,293 more acres as compared to Alternative B. Impaired water bodies were not specifically addressed in Alternative A.

Applying an NSO stipulation to important spring areas (38,056 acres) including the Courthouse Wash Watershed (51,790 acres) and Salt Wash Watershed (61,925 acres) would protect water quality in adjacent aquifers and watersheds from contaminants or diminished water quality from mineral development activities. This management would protect habitat for fish and other aquatic species, prevent degradation of riparian and wetland habitat, and provide clean water sources for wildlife use. Alternative C with its NSO stipulations provides greater protection than the CSU stipulation provided in Alternative B. Alternative A does not specifically address important spring areas and the Courthouse and Salt Wash Watersheds.

Closing the suitable WSR segments along the Colorado and Green Rivers to mineral leasing (19,347 acres) would prevent surface disturbance from leasing activities, and protect adjacent riparian or upland habitat from degradation or damage as a result of erosion and runoff. The closure to future mineral leasing activities would protect riparian and upland vegetation, reduce sedimentation and siltation of streambeds, protect fisheries, and support water quality. Wildlife that use riparian, upland, and wetland habitat such as warbling vireo, song sparrow, spotted towhee, along with amphibians, reptiles, and big game species would benefit from the undisturbed habitat and forage, and from the reduced presence of humans and machinery associated with mineral leasing. Habitat for Colorado River and Green River fish such as bluehead sucker and speckled dace would be protected from habitat damage or degradation by closing the river segments to future mineral development.

Impacts to wildlife habitat from minimizing impacts to sagebrush steppe through the Baseline CSU stipulation and BMPs in Alternative C would be similar to Alternative B, but the Baseline CSU stipulation would apply to all ecological conditions of sagebrush steppe habitat, protecting a much larger area of sagebrush steppe habitat for wildlife than Alternative B. This management would provide the greatest protection to sagebrush-obligate wildlife such as Brewer's sparrow and mule deer (UDWR 2005b). Alternative A does not specifically address sagebrush steppe habitat.

Impacts to wildlife habitat from applying BMPs for oil and gas leasing and development would be the same as those described in Alternative B.

Under Alternative C, a CSU stipulation to restrict noise would be applied oil and gas operations. This management could reduce the disturbance of wildlife and prevent disruption to big game and other wildlife during sensitive timeframes. Wildlife can become stressed and will flee or abandon habitat when noise reaches certain levels, with the level of noise sensitivity varying among wildlife species. Preventing or reducing disturbance to wildlife would allow wildlife to remain in high quality habitat with access to preferred cover and forage, which could reduce stress, and support reproductive success. A lease stipulation to address noise is not applied in Alternatives A and B, although Alternative B does apply BMPs for noise reduction. Therefore, Alternative C reduces impacts to wildlife from noise generated from oil and gas operations as compared to Alternatives A and B.

Impacts to pronghorn and other wildlife from applying TL stipulations in Alternative C would be similar to Alternative B2, but a much larger area of habitat would be protected for pronghorn fawning and other wildlife use. Under Alternative C, the TL stipulation would apply to 253,292 acres, 153,548 more acres as compared to Alternatives A and B. This management would provide greater protection to pronghorn from disturbance by human activity, vehicles, and mineral development activities during the sensitive fawning timeframe.

In Alternative C, applying an NSO stipulation for mineral leasing for bighorn sheep rutting and lambing habitat would provide greater protection than Alternative A, applying to slightly more habitat (5,758 acres); it would apply year round without providing exceptions for pipelines and geophysical operations. Alternative C applies an NSO stipulation with no exceptions rather than a CSU stipulation as in Alternative B and therefore provides greater protection to bighorn sheep than Alternative B. This NSO stipulation could protect bighorn sheep and other wildlife by reducing human presence, vehicle use, and development activity, which would prevent species dispersal to other less desirable habitat. Forage, cover, and corridors for travel and migration could be protected, and habitat fragmentation would be prevented within the protected areas. In addition, the NSO stipulation could prevent runoff into aquatic habitat, support water quality, and protect streambeds and spawning habitat from sedimentation or erosion.

Impacts to deer, elk and other wildlife from applying a TL stipulation in Alternative C for surface-disturbing activities from oil and gas development would be similar to those described under Alternative A, but a larger area of crucial winter habitat would be protected, 52,078 acres more than in Alternative A and 10,630 acres more than in Alternative B. Impacts from applying the Baseline CSU to deer and elk habitat would be the same as described in Alternative B.

4.20.6 Impacts from Alternative D

Impacts to wildlife and fish habitat from applying an NSO stipulation up to 0.5 mile radius for cultural sites (22,328 acres) would be the same as Alternative B, but provides less protection than that described in Alternative C.

Impacts to fish and wildlife habitat from applying an NSO for the Three Rivers mineral withdrawal would be the same as those described in Alternatives A and B. Alternative C provides more protection than that provided in Alternative D.

In Alternative D, impacts to wildlife and fish habitat from maximizing oil and gas lease size and thus reducing or eliminating redundant infrastructure from oil and gas development would be the same as those described in Alternatives B and C.

Impacts to wildlife and fish habitat from not issuing oil and gas leases within PLAs (103,619 acres) would be similar to those described in Alternative B1.

Impacts to wildlife and fish habitat from applying a CSU stipulation to all potash leases that requires processing facilities to be located within a PPFA (42,292 acres) would be similar to Alternative B1; however, an exception could allow for small-scale potash processing facilities within the PLAs, allowing an additional disturbance of up to 100 acres. If the smaller potash processing facility were to be developed, damage, degradation, or removal of wildlife habitat would occur within the 100 acres, along with fragmentation of habitat; and disturbance from humans, construction activities, or vehicle traffic could occur during construction and operation of the facilities. Direct habitat loss or degradation of habitat could force wildlife to relocate to other areas where competition for forage and other habitat resources could increase. Increased competition for resources could lead to decreased health and reproduction, and could result in increased predation or mortality. Invasive, non-native plant species could be introduced and spread by vehicles and machinery during operation of the facilities, which could change vegetation composition and function, making habitat inhospitable for native plant species and could lead to further losses of wildlife habitat. Erosion or runoff could damage or degrade habitat for fish and other aquatic wildlife.

Table 4-70 shows the acres of big game habitat by potash leasing stipulation within the proposed PPFAs. Impacts to wildlife and big game would be nearly the same as described in Alternative B1. There are only very minimal differences for the number of acres of habitat protected by the NSO stipulation, as well as the number of acres within CSU stipulation for Alternatives B1 and D.

Table 4-70. Big Game Habitat within the Potash Processing Facility Areas by Potash Leasing Stipulation for Alternatives B1 and D (only)

Leasing Stipulation	PPFA Alternative B1 (acres)	PPFA Alternative D (acres)
Deer and Elk Habitat		
CSU/TL	1,484	1,484
NSO	146	146
Pronghorn Habitat		
CSU/TL	38,726	38,720
NSO	2,416	2,422
Desert Bighorn Sheep Habitat		
CSU/TL	9,133	9,133
NSO	420	420

Applying the Baseline CSU stipulation for all mineral development on 213,218 acres, could reduce surface disturbance when compared to Alternative A, which primarily consists of timing limitations. Impacts to wildlife and fish habitat from the Baseline CSU stipulation would be the same as described under Alternative B1, but would apply to slightly more acres than Alternative B1 (5,033 more acres than Alternative B1). Under Alternative C, the Baseline CSU stipulation would be applied to fewer acres compared to Alternative D because many more acres in Alternative C are protected by NSO stipulations or are closed.

Alternative D provides exceptions to the NSO stipulation for visual resources, the Baseline CSU stipulation, and the CSU stipulation for potash leases that would allow small-scale potash processing facilities within PLAs, which could result in additional development activity, surface disturbance, and habitat loss, along

with additional habitat fragmentation, additional erosion, sedimentation of spawning habitat, degradation of fisheries and riparian habitat. These exceptions mean that Alternative D provides less protection to wildlife habitat than does Alternative B1.

Under Alternative D, as in Alternatives B1, B2, and C there are zero acres managed as open to oil and gas and potash leasing with standard terms and conditions as compared with the 210,884 acres in Alternative A. Therefore, Alternative D could result in the less damage or removal of wildlife and fish habitat as compared to Alternative A.

Approximately 344 acres of vegetation and topsoil could initially be removed for oil and gas development in the next 15 years, which would result in direct loss of wildlife habitat, further degradation of surrounding habitat, fragmentation of habitat; and disturbed areas would be vulnerable to the introduction and spread of noxious weeds, leading to additional loss of native vegetation resources and wildlife habitat. Over the long term, reclamation would occur and habitat could re-establish within 96 acres, leaving 248 acres of net surface disturbance within potential wildlife habitat (95 fewer acres than Alternative A). Reclaimed areas could provide new vegetation and seral stages of habitat for wildlife as revegetation efforts are completed.

Applying CSU and TL stipulations in Alternative D to oil and gas leasing on 230,765 acres would result in similar impacts to wildlife and fish habitat as those described in Alternatives B1 and B2. While Alternative D has 209,781 fewer acres than Alternative A that are managed with a CSU or TL stipulation, all of these acres are managed more restrictively (NSO and closed) in Alternative D. Thus, Alternative D provides more protection to wildlife and fish habitat than does Alternative A. While Alternative D has 175,966 more acres than Alternative C that are managed with a CSU or TL stipulation, the majority of these acres are managed more restrictively in Alternative C. Thus, Alternative C provides more protection to wildlife and fish habitat than does Alternative D.

Applying an NSO stipulation to oil and gas leasing in Alternative D would prevent surface-disturbing activities from oil and gas development on 305,899 acres, which is 172,325 more acres as compared to Alternative A but 245,700 acres fewer than Alternative C. While Alternatives B1 and B2 manage 146,390 more acres with an NSO stipulation as opposed to Alternative D, the majority of these 146,390 acres are managed as closed in Alternative D. Thus, Alternative D provides more protection to wildlife and fish habitat than do Alternatives A, B1, and B2, but less protection than Alternative C. The largest areas of habitat protected are pinyon-juniper (146,998 acres), blackbrush (72,306 acres), and a much larger area of sagebrush (23,183 acres) is protected in Alternative D (21,887 more acres than Alternative A). Habitat for wildlife such as Western bluebird (*Sialia mexicana*), chipping sparrow (*Spizella passerina*), kangaroo rat, sage sparrow, and Brewer's sparrow, would be protected within these habitats (Gillihan 2006, USFS 2013, UDWR 2005b). Larger areas of habitat for big game are protected in Alternative D compared to Alternative A: 79,875 acres of deer and elk habitat (64,459 more than Alternative A), 57,499 acres of pronghorn habitat (37,159 more than Alternative A), and 169,250 acres for bighorn sheep (48,077 more than Alternative A) (Table 4-63).

Closing 145,284 acres to oil and gas leasing in Alternative D, 144,531 more acres than Alternatives A and B, would prevent damage or loss of vegetation resources from development activities, retain stable soil resources, prevent erosion or runoff and protect an intact ecosystem. Impacts to wildlife and fish habitat would be similar to Alternatives A and B, but would cover a much larger area. Under Alternative D, the largest areas of habitat protected within the closed areas would be blackbrush (45,605 acres) and pinyon-juniper (60,255 acres), which contain habitat for kangaroo rat, raptors, juniper titmouse, and pinyon jay (Gillihan 2006, USFS 2013). Habitat for big game would be protected within the closed areas where it was not under Alternative A for deer and elk (10,272 acres), and pronghorn (8,128 acres) plus 61,081 acres more for bighorn sheep (compared to 753 acres in Alternative A). The acreage closed in Alternative D is

34,885 fewer acres than Alternative C. Therefore, Alternative C provides the most protection to wildlife and fish habitat.

In Alternative D, potash leasing would only be permitted within the PLAs (103,619 acres), with 57,308 of these acres available for potash leasing with CSU and TL stipulations, and the remaining 45,311 acres available with NSO stipulations. Impacts to wildlife and fish habitat from well drilling would be similar to those impacts from oil and gas well drilling. Impacts to fish and wildlife habitat from potash well drilling would be similar to those described under Alternative B1, but with only slight changes in acres protected by lease stipulations. Big game habitat protected under the NSO and CSU stipulations for potash leasing is very similar between Alternatives B1 and D with the only difference being that 410 more acres of bighorn sheep habitat is covered by CSU stipulations and 410 fewer acres are not protected by the NSO stipulation (Table 4-71).

Table 4-71. Big Game Habitat within the Potash Leasing Areas by Potash Leasing Stipulation for Alternatives B1 and D (only)

Lease Stipulation	PLA Alternative B1 (acres)	PLA Alternative D (acres)
Deer and Elk Habitat		
CSU/TL	0	0
NSO	3,193	3,193
Pronghorn Habitat		
CSU/TL	32,983	32,983
NSO	29,785	29,785
Desert Bighorn Sheep Habitat		
CSU/TL	38,402	38,812
NSO	27,222	26,812

Applying a CSU stipulation to all potash leases that requires processing facilities to be located within a PPFA would have the same impacts to wildlife and fish habitat as those described in Alternative B1. Alternatives B2 and C do not provide for potash leasing and as a result, there would be no impacts to wildlife and fish habitat resulting from potash processing facilities.

Impacts to habitat for wildlife and fish from making approximately 681,948 acres deferred to potash leasing are the same as those described in Alternative B1. However, Alternatives B2 and C close the entire Planning Area to potash leasing and development and therefore provide the greatest protection to wildlife and fish habitat.

Impacts to habitat for wildlife and fish by applying a TL stipulation to saline soils would be the same as those described under Alternative B1.

Impacts to habitat for wildlife and fish from applying a CSU stipulation for offsite reclamation for areas of saline soils would be the same as those described in Alternative B.

Impacts to habitat for wildlife and fish from applying a CSU stipulation for slopes greater than 21 percent would be the same as those described in Alternative B.

Impacts to wildlife and fish habitat from applying an NSO stipulation to preclude mineral activities within public water reserves, 100-year floodplains and within 500 feet of intermittent and perennial streams, rivers, riparian areas, wetlands, water wells, lakes, and springs (69,786 acres) and applying an NSO stipulation to preclude mineral activities within 750 feet of the Colorado River and Fisher Creek (4,590 acres) would be the same as those described under Alternative B and more than those described in Alternative C.

Impacts to wildlife and fish habitat from applying an NSO stipulation to the suitable WSR segments along the Colorado and Green Rivers would be the same as those described under Alternatives A and B, but more than those described in Alternative C.

Impacts to wildlife and fish habitat from minimizing impacts to sagebrush steppe through the Baseline CSU stipulation would be the same as those described in Alternatives B1, B2, and C. In addition, applying a CSU stipulation requiring compensatory mitigation outside the area of impact in sagebrush-steppe habitat within PPFAs would have the same impacts to wildlife and fish habitat as those described in Alternative B1.

Impacts to wildlife and fish habitat from applying BMPs for mineral leasing and development would be the same as those described in Alternative B.

Impacts to wildlife and fish habitat from applying a CSU stipulation for noise mitigation would be the same as those described in Alternative C.

Impacts to pronghorn, bighorn sheep, and other wildlife from applying TL stipulations for fawning habitat and applying CSU stipulations for lambing and rutting habitat would be the same as those described in Alternative B1.

Impacts to elk, deer and other wildlife from applying a TL stipulation for fawning, calving, and crucial winter habitat would be the same as those described in Alternative B.

4.21 CUMULATIVE IMPACTS

This section defines cumulative impacts, describes the methodology used for assessing these impacts, describes projects and activities considered in this assessment, and presents the results organized by resource topic.

The CEQ regulations for implementing NEPA define cumulative impacts as—

> *"The impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR §1508.7).*

The full effect of any single action cannot be determined by considering that action in isolation, but must be determined by considering the likely result of that action in conjunction with many others. The cumulative impact analysis for the MLP/FEIS evaluates the potential impacts associated with the management alternatives in combination with the potential impacts associated with other relevant activities that have occurred, are occurring, or are likely to occur within the area of analysis.

4.21.1 Impact Assessment Methodology

BLM planning-level decisions are programmatic decisions that allocate resources or specify allowable uses in all or portions of the Planning Area to emphasize certain management direction. As a result, the cumulative impact analysis is also broad and general in nature. The analysis presents ranges and qualitative conclusions as opposed to bounded quantified details. These cumulative impacts will be considered in subsequent NEPA documents that analyze specific projects or programs.

Analysis and description of the identifiable effects of past actions are required to the extent they are relevant and useful in analyzing whether the reasonably foreseeable effects of the alternatives may have a continuing, additive, and significant relationship to those present effects. Based on scoping, agencies have discretion on what is useful concerning past action for the agency's analysis of the effects of present action and its reasonable alternatives. Effects of past actions and activities on resources are manifested in the current condition of the resource, which is described in Chapter 3 (Affected Environment) for resources on lands administered by the BLM within the Planning Area. Specific information presented in Chapter 3 is not repeated here.

CEQ guidance directs cumulative impact analysis to focus on important issues of national, regional, or local significance. This analysis focuses on alternative mineral leasing and development decisions that, when combined with other past, present, and reasonably foreseeable actions, would collectively be significant. Not all issues identified for direct or indirect impact assessment in this MLP/FEIS are analyzed for cumulative effects. Because of the wide geographic scope of a cumulative impact assessment and the variety of activities assessed, cumulative impacts are commonly examined at a more qualitative and less detailed level than are direct and indirect impacts.

Public documents prepared by Federal, State, and local government agencies are the primary sources of information regarding past, present, and reasonably foreseeable actions considered in the cumulative effects analysis. Actions undertaken by private persons and entities are assumed to be captured in the information made available by such agencies. Speculative or uncommitted projects are not included in the projections. These projections are not planning decisions. Using them in this analysis does not constitute approval by the BLM or any authorizing agency. These projections do not set a limit or cap on future BLM actions.

Unforeseen changes in such factors as economics, public demand, and Federal, State, and local laws and policies could result in different outcomes than those projected for this analysis.

Potential cumulative impacts are described for each affected resource within a defined cumulative impact analysis area (CIAA). The CIAA covers different geographic areas depending on the specific resource being evaluated. The CIAAs are described in each of the resource sections below. CIAAs that extend beyond the Planning Area are largely for resources that are mobile or migrate, compared to resources that are stationary. For example, the air quality CIAA is large because it is based on the complex interaction between climatic factors, terrain, and the potential for significant impacts to occur in sensitive areas within the airshed. Smaller CIAAs were established for resources that are stationary such as cultural resources, minerals, and visual resources. In some cases, these CIAAs might be the same as the Planning Area boundary. Activities and development that occur within or outside the CIAAs have the potential to create cumulative impacts on the specific resource being analyzed.

The BLM considered the following factors in this cumulative impact assessment:

- Federal, non-Federal, and private actions
- The potential for effects to cross political and administrative boundaries
- Other spatial and temporal characteristics of each affected resource
- The comparative scale of cumulative impacts across alternatives
- Scoping comments.

Temporal and spatial boundaries used in the cumulative analysis are developed on the basis of resources of concern and actions that might contribute to an impact. The baseline date for the cumulative impacts analysis is 2014. The reasonably foreseeable actions utilized in this analysis are projected using a 15-year planning horizon.

4.21.2 Projects and Activities Considered

The following current and reasonably foreseeable activities were identified as having the greatest likelihood to generate potential cumulative impacts when added to activities associated with the alternatives for the MLP/FEIS:

- Continued expansion of U.S. Highway 191 (to four lanes from two lanes).

- The RFDs for oil and gas and potash.

- An increase in recreational use of BLM lands, both motorized and non-motorized. This would result in more conflicts with recreational users. There is an estimated 3 percent growth in recreation use per year.

- Construction of 40 additional miles of single track mountain bike trail.

- Campground development in the Indian Creek corridor.

- A 9,000 barrel per day refining facility on private land north of I-70 near Green River (pipeline and railroad siding on BLM). The project is located outside the Planning Area, but oil and gas from the Planning Area would be sent to the refinery. A portion of the proposed pipeline is in the Planning Area.

- Paving of the graveled Anticline Overlook Scenic Backway (expected to increase visitation to the northern portion of the Canyon Rims SRMA).

- Russian olive and tamarisk treatments along the Colorado River from the Moab boat ramp to Potash boat ramp.

- Continuation of livestock grazing.

Activities and development that occur within the CIAAs have the potential to create cumulative impacts on the specific resource being analyzed. Oil and gas and potash development presents the highest likelihood for impacts within the Planning Area. Anticipated oil and gas and potash projects within the Planning Area are encompassed by the oil and gas and potash RFDs for the Planning Area. The projects listed above are not presented as an exhaustive list of actions, but every effort has been made to present a representative list of actions that could contribute to cumulative impacts. Past decisions and management that continue to affect cumulative impacts are described in Chapter 3.

4.21.3 Cumulative Impacts by Resource

Air Quality

The CIAA for air quality is the airshed within the Planning Area, as well as adjacent regional airsheds due to wind patterns and transport and circulation of emissions. Past, present and reasonably foreseeable future actions and conditions within the CIAA that have affected and will likely continue to affect air quality include emissions from oil and gas development, large power plants, metropolitan areas, and mobile sources. Oil and gas development has occurred, is occurring, and will continue to occur on both Federal and non-Federal oil and gas estate within the Planning Area. The same is true for potash development. Exploration for and development of oil and gas and potash resources contribute to short-term particulate matter emissions that can combine with naturally occurring dust generation to create temporary cumulatively degraded visibility conditions depending on the timing and location of the cumulative actions. They also contribute criteria pollutants and hazardous pollutants through the combustion of fuel in drill rigs, construction equipment, and vehicles, potentially resulting in increases in ambient concentrations of these pollutants.

Past, present, and reasonably foreseeable future actions and conditions within the CIAA that have contributed GHGs to the atmosphere include mineral (oil and gas and potash) development and fuel combustion. Oil and gas and potash development has occurred, is occurring, and would continue to occur on both Federal and non-Federal mineral estate within the Planning Area. Oil and gas and potash development results in emissions of GHGs during fuel combustion in vehicles, drill rigs, and construction equipment, and through emissions of methane associated with oil and gas production.

Regional Cumulative Analyses

The regional cumulative analysis will evaluate the emissions and sources quantified for far-field modeling and place them into a regional context. Source apportionment will be used to estimate the impact current emissions have on monitored and modeled ozone, $PM_{2.5}$ and visibility in Canyonlands National Park. These pollutants for concern have been identified in Chapter 3, Affected Environment (3.2) as being regional in scope, with similar monitored values occurring throughout the rural southwest. How sources within the Planning Area affect regional concentrations, and how regional sources affect concentrations within the Planning Area will be examined.

In 2013, the WRAP WestJump Air Quality Modeling Study was completed (WRAP 2014). This study was intended to initiate the next generation of regional technical analysis and support for ozone transport and attainment demonstrations for the intermountain West. The project incorporated all of the recent western modeling analyses into a single modeling database, and went through a comprehensive model performance evaluation in an open technical forum independent of any specific project or regulatory activity. One of

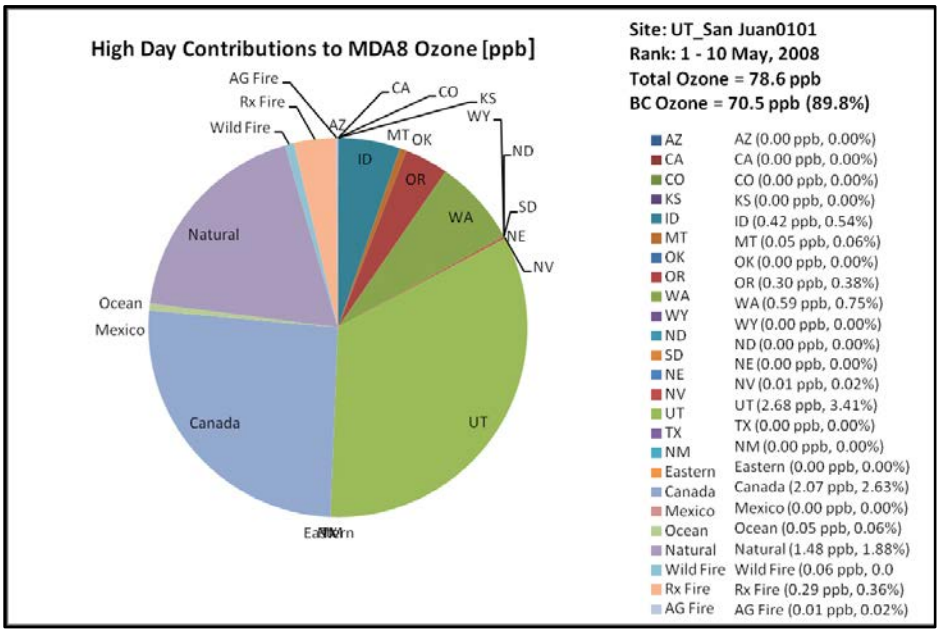
the functions of the modeling platform is the ability to perform a comprehensive source apportionment analysis to evaluate local source, western regional, natural and international impacts of elevated ozone impacts (both rural and urban) across the west and at specific locations within the modeling domain.

For purposes of this analysis, Canyonlands National Park was chosen as a source receptor to evaluate both local and regional emission sources impacts on ozone, $PM_{2.5}$, and visibility. The appendices located in the Final Report of the 2013 document hold interactive Excel files that you can specify for given areas and emissions across the West Coast. The print outs are extremely detailed from these reports, and the charts were narrowed down by the major contributors that are labelled on each. The appendices used can be found at: http://www.wrapair2.org/WestJumpAQMS_Model_Results_UT_April16_2014.pdf

The regional cumulative impacts will be presented through a series of graphs, which illustrate how sources within the Planning Area affect regional concentrations, and how regional sources affect concentrations within the Planning Area.

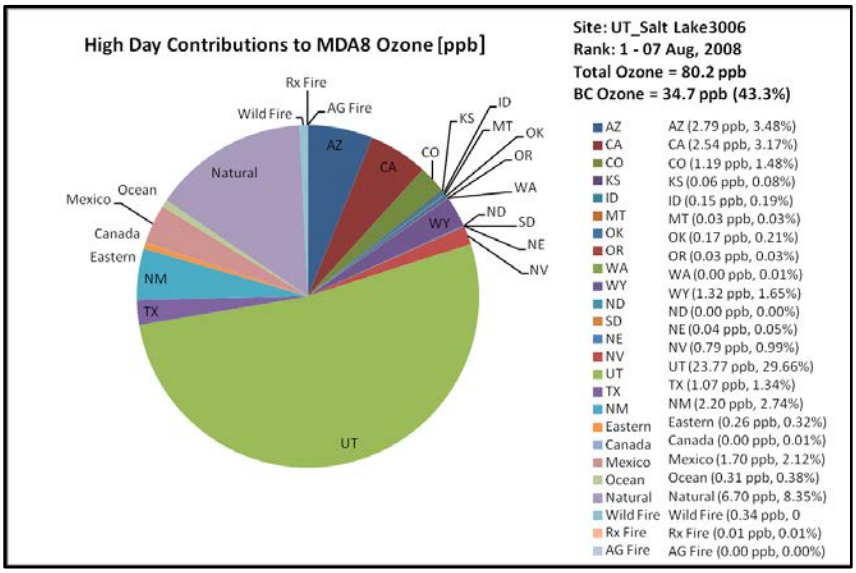
Figure 4-3 shows a modeled ozone concentration for May 10, 2008, and where contributions to the modeled value originate and the magnitude of that contribution. The Boundary Condition (BC) contribution is the amount of modeled ozone that is entering the airshed from locations not apportioned, and can be thought of as a large scale regional background. As can be seen on the graph, almost 90 percent of modeled ozone on that day was from outside the region, with sources within Utah making up the next largest contributor at 3.4 percent.

Figure 4-3. State Contributions to Modeled Highest Ozone Day at Canyonlands National Park, Utah Site



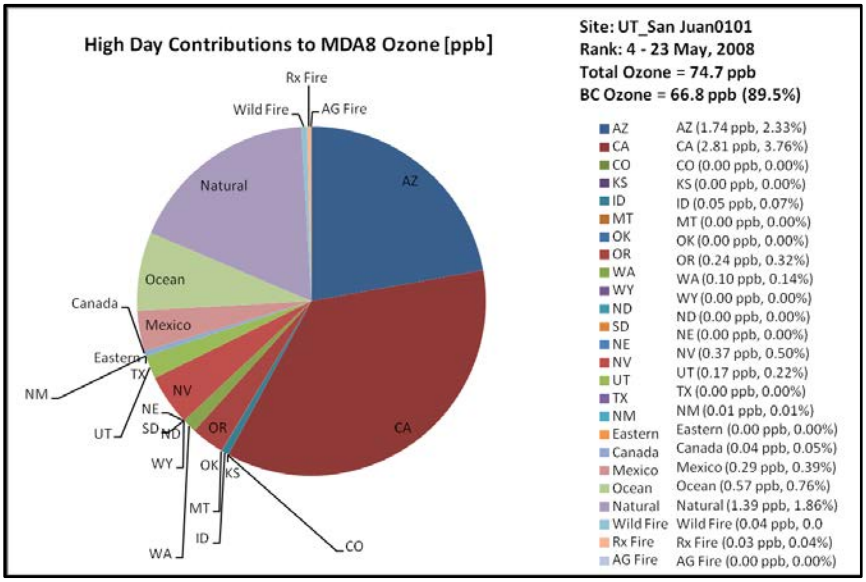
For comparison purposes, the highest modeled day that same year for Salt Lake City, a large metropolitan area, shows the Utah contribution equaling almost 30 percent (Figure 4-4). This is due to a much larger number of emission sources in Salt Lake City compared to the sources vs. concentration ratio found in the Planning Area.

Figure 4-4. State Contributions to Modeled Highest Ozone Day at Hawthorne School, Salt Lake County, Utah Site



Meteorological conditions can also play a dominate role in source contributions to monitored or modeled values. Figure 4-5 shows the modeled 4th highest ozone concentration for 2008 in Canyonlands National Park, and the major source contributors have radically changed. California, followed by Arizona, now makes up the dominate source contributors, with Utah sources only contributing 0.22 percent. This is most likely due to predominate winds that day transporting ozone from outside the Planning Area.

Figure 4-5. State Contributions to Modeled 4th Highest Ozone Day at Canyonlands National Park, Utah Site

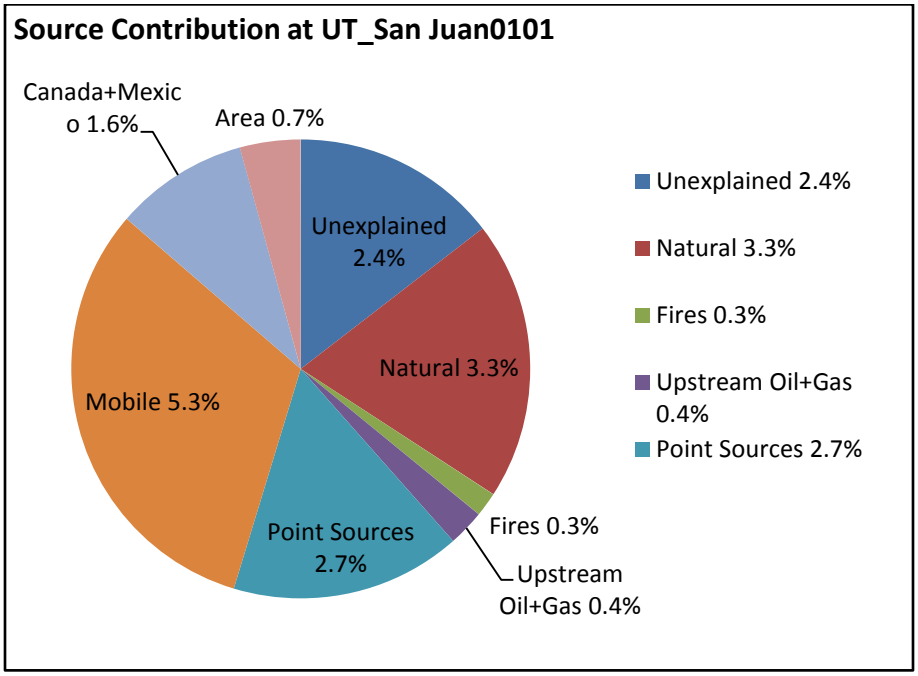


Based on the source apportionment by State contributions data, sources within the Planning Area are unlikely to significantly contribute to modeled or monitored ozone concentrations. While sources within

the Planning Area do not contribute significantly, they do contribute incrementally to both Planning Area and regional ozone concentrations.

The WestJump source apportionment tool also allows the user to specify source contributions by type; for instance mobile, point, oil and gas, and/or fires. Figure 4-6 shows a modeled Planning Area ozone concentration of 70.0 ppb with 11.7 ppb (16.7 percent) due to regional sources. Mobile sources (cars and trucks) make up the largest single source category, followed by natural sources (primarily vegetative volatile organic compound [VOC] emissions), and point sources (e.g., power plants). Oil and gas emission account for less than 1 percent of the regional source category emissions. This would not be an unusual source category breakdown for rural airsheds in the Western United States.

Figure 4-6. Regional Source Type Contributions to Planning Area Modeled Concentration



Based on extrapolated $PM_{2.5}$ monitoring data from the IMPROVE monitoring site operated by the Park Service at Canyonlands National Park, ambient $PM_{2.5}$ concentrations are well below the applicable NAAQS. It would be expected that $PM_{2.5}$ concentrations regionally are also well below the NAAQS, given the paucity of large sources and dispersed population. Little monitoring data exists to validate this however, and the Planning Area is designated as unclassifiable.

$PM_{2.5}$ can contribute to regional haze and visibility degradation in Class 1 airsheds (e.g., Canyonlands NP) at lower ambient concentrations than the NAAQS. Understanding the sources and composition of $PM_{2.5}$ is important for informing management actions related to source controls and mitigation. Using the WestJump source apportionment tool, the composition of modeled $PM_{2.5}$ concentrations can be estimated for both total sources within the Planning Area, and specific for the oil and emission category. Figure 4-7 shows the composition of modeled ambient $PM_{2.5}$ in the Planning Area, and Figure 4-8 shows the composition of modeled ambient $PM_{2.5}$ from just oil and gas sources. As is apparent, crustal material (dust) makes up the majority of composition in both graphs. Nitrogen oxides (engine exhaust) and sulfates (diesel emissions) make up most of the remainder of the oil and gas component.

Figure 4-7. Planning Area Modeled PM2.5 Compositions

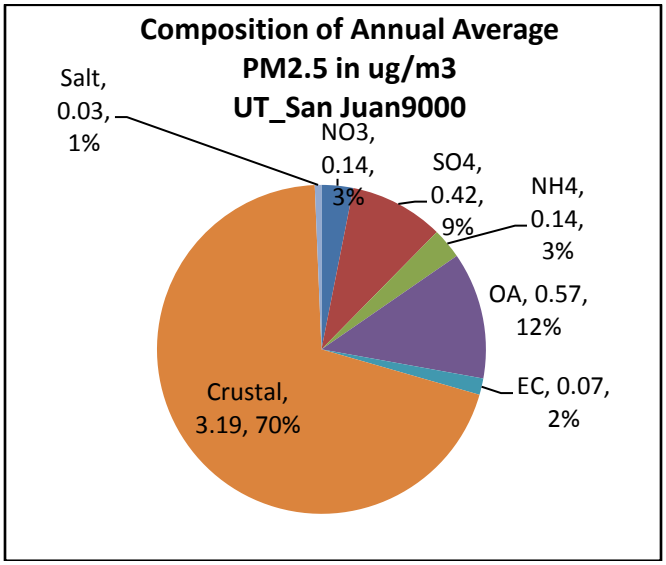
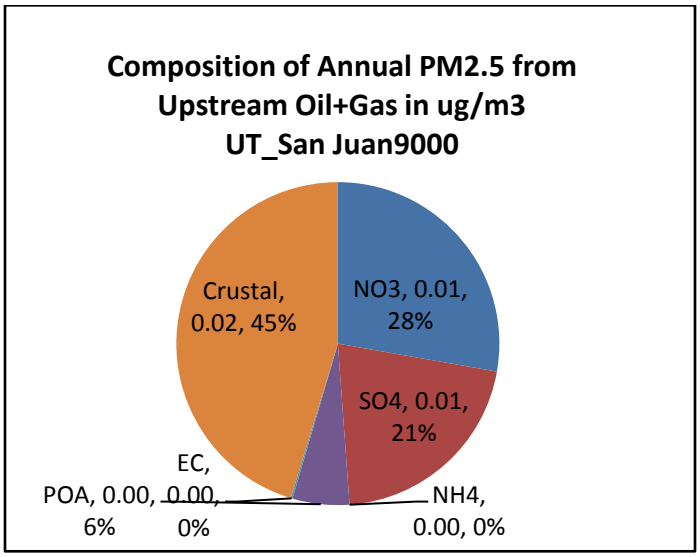
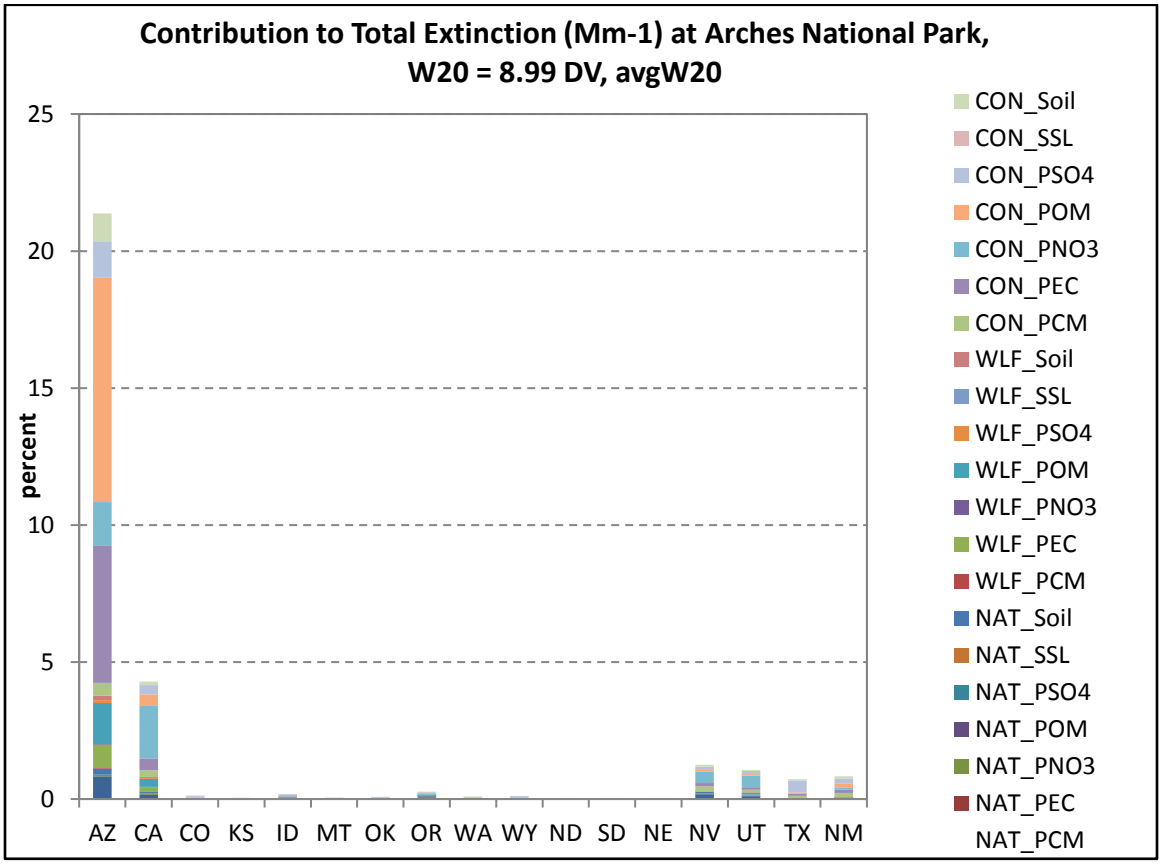


Figure 4-8. Oil and Gas Source Category PM2.5 Compositions



Another way to evaluate contributions to visibility in the Planning Area is the State contribution to light extinction broken down by source contribution. Figure 4-9 shows modeled State contributions with columns divided by source contribution. Arizona is the dominant source of visibility reducing components, with crustal materials being the largest contributor, followed by California. Utah, New Mexico, and Nevada all are apparent, with the remainder minimal. As with the modeled ozone comparisons shown in Figure 4-3 and Figure 4-5, these modeled impacts would be sensitive to meteorological conditions, and could vary widely.

Figure 4-9. State Contribution to Total Extinction at Arches National Park



Emissions of ozone precursor gases within the CIAA were found to contribute a relatively minor amount to modeled ozone concentrations in the CIAA, with the largest contributors being in San Juan County being mobile sources followed by point sources. The ratio of emissions within the Planning Area to total regional emissions is unlikely to change to a significant degree over the life of the planning period. Overall emissions may grow the relative contribution to observed monitored values in the Planning Area and regionally will continue to be only slightly impacted by emissions from within the Planning Area.

Ozone concentrations will continue to approach and occasionally exceed the NAAQS in the CIAA, and may violate under the proposed new NAAQS for ozone, although the contributions from ozone precursor generating activities in the Planning Area will continue to not be a determinant factor in these concentrations. Ozone will continue to be a regional issue in Southeast Utah, with the primary contributors being sources outside the CIAA. Reasonable controls to reduce the emissions of ozone precursors from oil and gas activities, and to a lesser extent potash, should be required to reduce the relatively minor contribution emissions sources in the CIAA have on regional ozone formation and transport.

Cultural Resources

The CIAA for cultural resources consists of the public lands within the Planning Area because the projected development for the alternatives in the MLP/FEIS would not affect cultural resources outside the Planning Area. Cumulative impacts to cultural resources within the CIAA can occur to the physical remains of historic properties and can also impact the integrity of the visual setting where the property is located.

Current and future actions in the CIAA that are most likely to contribute to the cumulative impacts for cultural resources and resources of religious or traditional importance to Native American tribes include oil and gas and potash leasing and development and an increase in recreational uses. These actions are associated with surface-disturbing activities and increased human presence, which could affect cultural resources and cultural landscapes through loss and disturbance, changes in setting, and theft or vandalism.

On public lands, these actions would require adherence to cultural resource laws and regulations that would prevent or mitigate potential adverse impacts. However, the potential for cumulative impacts to cultural resources include State and private lands within the Planning Area, which are not afforded the same protection as on public lands.

The mineral development projected in the different alternatives for the MLP/FEIS would result in surface-disturbing activities, which could contribute to the cumulative impacts to cultural resources. The alternative with the highest amount of area precluded from mineral surface development would have the least potential for contributing to cumulative impacts. Conversely, the alternative with the least amount of area precluded from mineral surface development would have the greatest potential for contributing to cumulative impacts. Therefore, Alternative C would contribute the least to cumulative impacts for cultural resources and Alternative A would contribute the most. Alternatives B1, B2, and D would contribute an intermediate amount. The incremental contribution of the alternatives for the MLP/FEIS on the cumulative impacts to cultural resources is anticipated to be minimal since cultural resources are managed and protected on public lands in compliance with Federal laws, regulations, and policies.

Lands and Realty

The CIAA used to analyze cumulative impacts on the uses administered by the lands and realty program includes the entire Planning Area. Cumulative impacts on lands and realty management would result from actions that create constraints and/or opportunities for land use authorizations consisting of rights-of-ways (pipelines, power lines, transmission lines, roads) and permits (filming locations).

The number of land-use authorizations (rights-of-ways and permits) is a function of demand for these uses. Future development of adjacent State and private lands would likely result in additional requests for land use authorizations. In addition, mineral development projected in the alternatives for the MLP/FEIS could result in requests for additional rights-of-ways for roads and pipelines proposed outside of a Federal lease.

The designation of right-of-way avoidance and exclusion areas on BLM lands in the Planning Area established in the Moab and Monticello Resource Management Plans contribute to the cumulative impacts for lands and realty by reducing the routing options for right-of-way facilities. Right-of-way avoidance and exclusion areas are established to protect sensitive resources. However, the MLP/FEIS does not address right-of-way avoidance and exclusion areas and therefore would not contribute any further to these cumulative impacts.

Lands with Wilderness Characteristics

The CIAA for lands with wilderness characteristics for the Planning Area considers both lands identified in the Moab and Monticello RMPs (2008) as having wilderness characteristics (192,220 acres) and lands subsequently identified as having wilderness characteristics (73,026 acres), which are within the Planning Area.

Past, present, and reasonably foreseeable actions within the CIAA that have affected and will likely continue to affect wilderness characteristics include oil and gas and potash development and increased recreational demands. Development of oil and gas and potash could introduce sights, noises, and infrastructure in or adjacent to lands with wilderness characteristics, which could impair the feeling of

solitude and degrade naturalness. Increasing visitor use in the Planning Area will likely intensify use of BLM-administered lands, including natural areas and lands with wilderness characteristics, potentially impacting wilderness characteristics by reducing opportunities for solitude.

Alternative A does not specifically mitigate impacts to lands with wilderness characteristics from oil and gas and potash leasing and development. Alternative A has the greatest potential to introduce sights, noises, and infrastructure in or adjacent to lands with wilderness characteristics, which could impair the feeling of solitude and degrade naturalness. Management specific for lands with wilderness characteristics under Alternatives B, C, and D would minimize or substantially reduce adverse impacts to solitude, naturalness, and primitive recreation associated with lands with wilderness characteristics. Overall, Alternative C provides protection to more lands with wilderness characteristics and would contribute the least amount to the cumulative effects to lands with wilderness characteristics followed by Alternatives B and D.

Livestock Grazing

The CIAA used to analyze cumulative impacts on livestock grazing includes the grazing lands within the Planning Area. Cumulative impacts to livestock grazing result from activities and actions that affect available forage on BLM lands, private lands, and State lands. Surface-disturbing activities such as mineral development, the presence of wildlife, and other activities such as exclosures, fire, or recreation use could result in forage degradation or loss of AUMs. Reclamation, vegetation treatments, and invasive, non-native plant control efforts would general enhance rangeland conditions and result in increased forage.

Past, existing, and future oil and gas and potash development projects, recreation use, and big game populations located within the CIAA have resulted in reducing AUMs and forage available for livestock as a result of an increase in soil disturbance, vegetation removal, the spread of invasive, non-native plant species, and livestock displacement. Impacts would be greater in areas with large populations of big game and areas with high-density mineral development projects. Oil and gas and potash development activities and related construction of roads, pipelines, and well pads would be the primary cause of direct forage removal and spread of invasive, non-native plant species. Alternative A would result in the largest losses of forage and AUMs. In turn, this loss would result in the greatest contribution to the cumulative impacts for livestock grazing, with Alternative C sustaining the fewest losses. However, these disturbances associated with mineral development have resulted in minor impacts to livestock grazing in the past and up to the present. These disturbances are also projected to be minor in the future.

Minerals: Oil and Gas

The CIAA used to analyze cumulative impacts on oil and gas development is the Planning Area. Past, present, and reasonably foreseeable actions and conditions within the CIAA that have affected and will likely to continue to affect oil and gas are market forces, availability of resources for development, regulatory and development constraints, and reservoir/reserve depletion.

The management actions proposed in the alternatives for the MLP/FEIS would cumulatively impact oil and gas development through surface use restrictions (e.g., closures, and CSU, TL, and NSO stipulations) that ultimately would decrease the amount of oil and gas development in the Planning Area. Precluding surface disturbance could prevent the construction of some well pads, access roads, pipelines, and ancillary facilities. Offsite methods such as directional drilling would be required to access oil and gas resources in areas managed with an NSO stipulation. In some cases, an operator could place a well pad, access road, or production facility in a less-sensitive area and drill from the well pad directionally to recover reserves underlying the area prohibited from surface-disturbing activities. The equipment and personnel required for directional drilling could increase the complexity of operations and slow the drilling process. Closures and surface use restrictions could cause an operator to move to nearby private or State land (if similar resources are available with fewer restrictions) and drill wells that could lead to drainage of Federal reserves

and loss of Federal revenue. However, the indirect and cumulative effects of consolidating infrastructure could reduce the need for ancillary infrastructure over the larger region as infrastructure becomes more centralized and less infrastructure would be necessary for the delivery of products.

Oil and gas leasing and development would continue under all alternatives. The restrictions imposed by leasing stipulations (CSU, TL, NSO) and closed areas result in impacts to oil and gas development, such as decreased amount of oil and gas extraction, delays in oil and gas extraction, increased requirements and complexity of operations, and additional costs. Under all alternatives, the lease stipulations reduce the number of well pads that were projected in the RFD scenario for oil and gas on all lands (Federal, State, and private) within the Planning Area over the next 15 years. There are 58 well pads projected for Alternative A, 38 well pads projected for Alternative B1, 47 well pads projected for Alternative B2, nine well pads projected for Alternative C, and 42 well pads projected for Alternative D. Alternative A would allow the greatest amount of wells to be developed and would have the fewest restrictions on development. Alternative C would allow the fewest number of wells to be developed to the major constraints imposed by lease stipulations and closures. Alternatives B1, B2, and D allow for a moderate level of oil and gas development. Alternatives B1 and D reduce the amount of oil and gas development in lieu of potash leasing and development in identified areas; however, oil and gas leasing and development could occur in these areas if potash leasing and development are not pursued.

Minerals: Potash

The CIAA used to analyze cumulative impacts on potash development is the entire Planning Area. Past, present and reasonably foreseeable future actions and conditions within the CIAA that have affected and will likely to continue to affect potash development are market forces, availability of resources for development, feasibility to develop the resource, regulatory, and development constraints, and deposit depletion.

The management actions proposed in the alternatives for the MLP/FEIS impact potash development through surface use restrictions (e.g., closures, and CSU, TL, and NSO stipulations) that would result in impacts to potash development, such as a decrease in potash development, delays in potash development, increased requirements and complexity of operations, and additional costs. Precluding surface disturbance could prevent the construction of some well pads, access roads, pipelines, and processing facilities. Under all alternatives, the lease stipulations and closures reduce the number of well pads that were projected in the RFD scenario for potash on all lands (Federal, State, and private) within the Planning Area over the next 15 years. The projected potash development in Alternative A is 18 production well pads producing 400,000 tons per year utilizing solar evaporation processing methods and 86 production well pads producing 2,000,000 tons per year utilizing crystallization processing methods. The projected potash development is Alternatives B1 and D are similar and include 12 production well pads producing 300,000 tons per year utilizing solar evaporation processing methods and 42 (B1) and 45 (D) production well pads producing 1,000,000 (B1) and 1,020,000 (D) tons per year utilizing crystallization processing methods. The entire Planning Area would be closed to potash leasing and development under Alternatives A and C.

Paleontological Resources

The area used to analyze cumulative impacts on paleontological resources includes the entire Planning Area. Surface-disturbing activities associated with oil and gas and potash leasing and development resulting from the alternatives for the MLP/FEIS are not expected to affect paleontological resources outside the Planning Area.

Past actions that have contributed to the cumulative impacts for paleontological resources include cross-country off-highway vehicle (OHV) use, indiscriminate dispersed camping, and mineral development. Ongoing permitted activities such as oil and gas development could also inadvertently impact

paleontological resources in areas where the potential for significant paleontological resources is high. Beyond authorized ground disturbance, cumulative impacts could occur from erosion, unauthorized collection, and vandalism. These cumulative impacts could result in the unmitigated loss of scientific information and could reduce the educational in interpretative potential of the resource.

For mineral development that results from the alternatives for the MLP/FEIS, adverse impacts to paleontological resources would be minimized through existing laws, regulations, lease stipulations, and BMPs within potential fossil yield classifications areas 3, 4, and 5. Measures to identify resources in areas with high potential for paleontological resources would allow evaluation by paleontologists in areas that had not previously studied, and fossils that would have otherwise been destroyed would be avoided or recovered and made available for study. Alternatives that provide the most constraints to mineral development and the associated surface-disturbing activities would contribute the least to the cumulative impacts to paleontological resources. Therefore, the incremental contribution to the cumulative impacts for paleontological resources would be the greatest with Alternative A followed in descending order by Alternatives D, B1, B2, and C.

Recreation

The CIAA used to analyze cumulative impacts on recreation is the entire Planning Area. Past and present actions that have had and are continuing to have impacts on recreation include linear right-of-way (ROW) projects, mineral development, OHV travel management, and the designation of SRMAs.

ROWs for electrical transmission lines and pipeline projects conflict with recreation opportunities. Mineral development can impact recreational opportunities by conflicting with recreation users and through the creation of noise and visual disruptions that affect user experiences. OHV travel management has benefitted cumulative effects on recreational experiences and resources by reducing surface impacts to soils, cultural resources, riparian areas, and wildlife habitat by generally confining travel to designated routes within the Planning Area. The cumulative impact on recreation resources has been enhanced in the long-term by designating SRMAs within the Planning Area. The SRMAs help to reduce the conflicts among the different recreation uses. The SRMAs are also beneficial for responding to the expected increase in visitation and changes in recreational demand.

The incremental contribution of cumulative impacts to recreation opportunities, setting, and experience for the projected mineral development in the alternatives for the MLP/FEIS would generally correspond to the amount of restrictions imposed to protect these resources from mineral activities. Alternative C precludes mineral related surface-disturbing activities within the SRMAs and would contribute the least amount to the cumulative impacts for recreation. Alternative A provides the least amount of restrictions to mineral development within the SRMAs and developed recreation sites, while Alternatives B1, B2, and D provide an intermediate amount of restrictions.

Riparian

The CIAA used to analyze the cumulative impacts on riparian resources includes the lands and waters within Planning Area. However, potential adverse impacts to riparian areas could extend beyond the Planning Area.

Past and present actions that have affected and will continue to affect riparian areas include livestock grazing, recreational uses (including OHVs and non-motorized recreation), mineral exploration and development, and upstream water withdrawals and impoundments. In general, these actions have all had cumulatively adverse impacts on riparian health. Livestock grazing, recreation, and mineral-related activities have led to surface disturbance, soil compaction, removal of riparian vegetation, bank trampling,

and alternation of riparian areas' physical structure. They have also resulted in the widespread introduction of invasive weeds.

Under all the alternatives for the MLP/FEIS, lease stipulations are provided that preclude mineral development within specified distances of riparian areas. These restriction could prevent or minimize damage or loss of riparian habitat and prevent degradation of riparian resources within and directly adjacent to the Planning Area. The contribution to the cumulative impacts for riparian resources would be negligible under all alternatives; however, Alternative C provides the most acres of protection surrounding riparian resources and Alternative A provides the least acres of protection. Alternatives B and D provide the same acreage of protection to riparian resources that is between the acreage protected in Alternatives A and C.

Social and Economic

The Socioeconomic Baseline Report documents recent trends in the economic and population growth of the socioeconomic study area. These trends are likely to continue. That is, there is a certain amount of natural growth that will continue in the socioeconomic study area regardless of the level of mineral resource development in the Planning Area. Development of the mineral resources of the Planning Area will generate new economic activity that will, for the most part, augment rather than replace the existing growth trends. Thus, economic growth would increase due to the alternatives for the MLP/FEIS, and social changes may result as well, as described in Section 4.12.6. The degree of additional growth, and the potential for social impacts, would be greatest under Alternative A and lowest under Alternatives C and B2. Alternatives B1 and D would fall in the middle vis-à-vis the other alternatives—generating additional growth and creating some potential for social impacts.

Future development of adjacent Federal, State, and private lands could have varied results when considered cumulatively with the alternatives for the MLP/FEIS. Modest levels of development, whether of mineral resources, other natural resources, or of real estate and businesses generally, would fall into the category of natural growth. Large levels of development—for instance, should a large industrial facility locate in the socioeconomic study area—would represent additional augmentation of growth, and could contribute a substantial amount to the cumulative socioeconomic effects in combination with some of the alternatives for the MLP/FEIS; specifically, Alternatives A, B1, and D.

Soil and Water Resources

The CIAA used to analyze cumulative impacts on soil and water resources includes the entire Planning Area. The projected mineral development in the alternatives for the MLP/FEIS are not expected to affect soil resources outside the Planning Area. However, watershed impacts (sediment delivery to stream systems, sedimentation, changes in frequency, duration and volume runoff) could extend beyond the Planning Area.

Past and present actions that have affected and will continue to affect soil and water resources include livestock grazing, recreation uses (including OHVs and non-motorized recreation), ROWs for pipelines and roads, and mineral exploration and development. In general, these actions have all had cumulatively adverse impacts on soil and water resources by causing surface disturbance contributing to reduced soil productivity, soil compaction, erosion, and subsequent sedimentation. They have also resulted in the widespread introduction of invasive weeds, which can affect water resources through increased evapotranspiration rates, and which can affect soil resources through alterations to soil chemistry and productivity.

Projected mineral development in the alternatives for the MLP/FEIS would result in surface-disturbing activities that involve the removal of vegetation cover, soil compaction, erosion, and loss of soil productivity. Mineral related construction of roads, pipelines, and well pads would be the primary causes

of surface disturbances. However, the level of impact varies with the nature and degree of disturbance as well as site specific environmental conditions.

In the alternatives for the MLP/FEIS, the application of CSU, TL, and NSO mineral leasing stipulations and BMPs developed specifically to protect soil and water on Federal lands would result in contributing a minimal amount to the cumulative impacts for soil and water resources. Alternative A provides the least restrictions to protect soil and water and would provide the greatest contribution to the cumulative impacts to soil and water resources. Alternative C would result in the least amount of mineral development and it would contribute the least to the cumulative impacts for soil and water resources. Alternatives B1, B2, and D would result in a greater contribution to the cumulative impacts to soil and water resources than Alternative C and less of a contribution than Alternative A.

Special Designations: Areas of Critical Environmental Concern

The CIAA for ACECs includes the existing ACECs and lands within the Planning Area. The relevant and important values that were used to establish the ACECs include cultural values, wildlife resources, scenic values, natural systems, and sensitive plant species. These values can be adversely impacted by surface-disturbing activities; however, past actions have not resulted in degrading these values to the extent that the areas did not warrant an ACEC designation.

Under all alternatives for the MLP/FEIS, surface-disturbing activities associated with mineral development are precluded in the ACECs. Therefore, the relevant and important values are protected and there is minimal potential for contributing to the cumulative impacts for ACECs. However, scenic values could be compromised by mineral development conducted adjacent to the ACEC boundaries where horizontal drilling could be utilized to access the minerals beneath the ACECs. Therefore, Alternatives C and D provide the greatest protection to ACECs with scenic values by closing the area to mineral leasing as compared to applying an NSO stipulation in Alternatives A and B.

Special Designations: National Historic Trails and Backways and Byways

National Historic Trails – Old Spanish National Historic Trail

The CIAA for the Old Spanish National Historic Trail (OSNHT) is the trail corridor and adjacent lands within the Planning Area. Management of national historic trails in the Planning Area is coordinated with the National Park Service and local non-Federal partners. The continued collaboration with these partners in managing the trail in accordance with the comprehensive management plan (NPS 1999) could decrease the potential for degradation and assist in the preservation of natural, cultural, and historic trail resources.

Past actions that have affected and will continue to affect the integrity of viewsheds in scenic and cultural landscapes along the OSNHT include the presence of power lines, pipelines, roads, and facilities. Projected mineral development in the alternatives for the MLP/FEIS could also contribute to cumulative impacts to the visual setting of the OSNHT through the placement of drill rigs, well pads, production facilities, roads, pipelines, and potash processing facilities. The alternatives for the MLP/FEIS provide varying mitigation for protecting the historic integrity and condition of the OSNHT but the contribution to the cumulative impacts should be minor due to the protections provided by the law and the comprehensive management plan. Alternative A provides no specific mitigation for protecting the trail and could result in contributing the most to the cumulative impacts to the OSNHT. Alternative B would provide a greater level of protection and a lesser amount of cumulative impacts to the OSNHT by specifying a 2 mile visual buffer around identified intact sites on the ground where the visual setting would be maintained. Alternative C provides the greatest protection to the OSNHT and contributes the least amount of cumulative impacts by delineating a 2 mile NSO zone on both sides of the designated trail. Alternative D provides more protection and less

cumulative impacts than Alternatives A and B but less protection and more cumulative impacts than Alternative C.

National Scenic Backways and Byways

The CIAA for the State Scenic Backways and Byways are the segments of backways and byways and adjacent lands within the Planning Area. These backways and byways were designated based on their scenic, aesthetic, cultural, historic, natural, and recreational qualities. These qualities can be adversely impacted by surface-disturbing activities and the presence of transmission lines, pipelines, surface disturbance, and the presence of facilities. However, past actions have not resulted in degrading the qualities of the backways and byways to the extent that they did not warrant scenic backway and byway designation.

Under all alternatives, scenic backways and byways are protected and there is minimal potential for contributing to the cumulative impacts for these roads. Alternative A provides the least protection to backways and byways by delineating a 0.5 mile corridor on both sides of these roads that would require mineral actions to meet the objectives of VRM Class II. In order to meet VRM Class II objectives, the mineral action must not attract the attention of the casual observer from key observation points. Alternatives B and D provide a higher level of protection than Alternative A by delineating a 1 mile corridor on both sides of the backways and byways where no surface-disturbing mineral activities can occur. However, Alternative D allows for an exception to the NSO leasing stipulation. Alternative C provides the greatest amount of protection to backways and byways by delineating a 2 mile corridor on both sides of these roads where no surface-disturbing mineral activities can occur.

Special Designations: Wild and Scenic Rivers

The CIAA for suitable Wild and Scenic Rivers (WSRs) are the segments of designated rivers and adjacent lands within the Planning Area. The outstandingly remarkable values that were used to establish the WSRs include scenic, fish, water oriented recreation, wildlife, geologic, historic, cultural, and ecological. These values can be adversely impacted by surface-disturbing activities; however, past actions have not resulted in degrading these values to the extent that the rivers did not warrant designation as suitable for the National Wild and Scenic Rivers System.

Under all alternatives for the MLP/FEIS, surface-disturbing activities associated with mineral development are precluded in the corridors for the suitable WSRs and there is minimal potential for contributing to the cumulative impacts for the WSRs. However scenic values could be compromised by mineral development conducted adjacent to the WSR boundaries where horizontal drilling could be utilized to access the minerals beneath the WSRs. Therefore, Alternative C provides the greatest protection to WSRs by closing the area to mineral leasing as compared to applying an NSO stipulation in Alternatives A, B, and D.

Special Status Species

The CIAA used to analyze cumulative impacts for special status species habitat includes the lands and waters within the Planning Area.

Past and present actions that have affected and will continue to affect the cumulative impacts for special status plants and animals within the Planning Area include surface-disturbing and other disruptive activities such as mineral development and associated infrastructure, pipeline and road development, OHV and recreation use, livestock grazing, and the introduction and spread of non-native, invasive plant species. Development activities can result in direct disturbance to special status wildlife species from vehicles, machinery, and human presence. These activities could result in short-term and long-term habitat loss, fragmentation and animal displacement. Habitats could become unavailable to wildlife because of human disturbance factors (e.g., traffic, noise, or energy development) during sensitive time periods such as winter,

birthing, nesting, and early rearing of young. Loss of vegetation from development activities would degrade habitat and increase competition for forage resources among special status and other wildlife species.

The Endangered Species Act (ESA) and other management for designated critical habitat and for threatened and endangered species would provide direct protection to ESA listed wildlife species and their habitat. Other management within the Moab and Monticello RMPs and the alternatives for the MLP/FEIS would provide BMPs and specific management for BLM special status species and other sensitive species that would prevent or reduce cumulative impacts to species and to habitat for plant and wildlife species. Management for watersheds, riparian areas, floodplains, and BMPs for soils and water quality would support habitat for endangered Colorado River fish and other special status species that use riparian, wetland, and aquatic habitat.

Oil and gas and potash development would cause the greatest amount of surface disturbance through construction of well pads, roads, pipelines, and other facilities. Reclamation and mitigation efforts would reduce impacts on special status wildlife; however, construction and maintenance of roads and well pads and the presence of humans would result in long-term or permanent impacts. Special status species, under the ESA and BLM sensitive species guidance, would be protected on Federal lands by site-specific mitigation, including exclusion or avoidance of all surface-disturbing activities; however, protection of non-Federally listed species on private and State lands may not occur, resulting in potentially significant impacts on these species. The degree of impact would depend on the timing of development activities and whether the amount of activity outpaces the successful reclamation and revegetation efforts in disturbed areas. Because of development (whether Federal mineral, commercial, or private residence), more pressure would be put on habitats outside of the development (likely private lands) as wildlife is displaced from the disturbances.

Surface disturbance could increase the spread of invasive, non-native plant species, which could increase the need for weed-controlling activities. Vegetation treatments could cause short-term impacts on vegetation by decreasing vegetation production and increasing establishment of early successional species. Long-term effects could include increased production and diversity of vegetation communities. Untreated weeds on non-BLM lands that spread to adjacent BLM-administered lands would result in degradation of native habitat. The degree of impact on special status species habitat would depend on the timing of activities and whether the amount of activity within the Planning Area outpaces successful reclamation and revegetation efforts in disturbed areas.

For the alternatives in the MLP/FEIS, the contribution to the cumulative impacts on special status plant and wildlife species would be the greatest under Alternative A, which has the least restrictions on mineral development, and would be the least under Alternative C, which has the most restrictions. The contribution to cumulative impacts resulting from Alternatives B1, B2, and D would be greater than Alternative C due to fewer restrictions on mineral development. However, the contribution to the cumulative impacts for special status species for all the alternatives would be negligible due to protections provided by the ESA, BLM sensitive species guidance, BMPs, and specific mitigation imposed in the alternatives.

Vegetation Resources

The CIAA used to analyze cumulative impacts on vegetation resources includes the lands within the Planning Area.

Past and present actions that have affected and will continue to affect vegetation include surface disturbance resulting from mineral development and associated infrastructure, geophysical exploration, vegetation treatments, cross-country OHV use, and recreation within the Planning Area. These activities could result in short-term and long-term vegetation loss, habitat fragmentation, soil compaction, soil erosion, and

surface runoff. Development activities would also modify the composition and structure of vegetation communities and increase the potential for invasive, non-native plant infestations within disturbed areas, leading to degraded vegetation communities, which are more susceptible to disease and lower species diversity.

Oil and gas and potash development and associated infrastructure would cause the greatest amount of surface disturbance and impacts to vegetation through construction of well pads, roads, pipelines, fuel tanks, and potash processing facilities. The impacts would likely be greater where mineral development is more intense, in areas where development overlaps with sensitive vegetation habitat, and on State and private lands to less protections afforded to natural resources in these areas. Increased mineral development could lead to an increase in the potential for vegetation loss and the introduction of invasive, non-native plant species.

Under all alternatives in the MLP/FEIS, the projected mineral development and associated surface-disturbing activities would result in vegetation loss, which would contribute to the cumulative impacts for vegetation. The greater the projected amount of mineral development the greater the potential contribution to cumulative impacts for vegetation. Alternative A would result in the most mineral development followed in descending order by Alternatives D, B1, B2, and C. Alternative C would result in the least amount of projected mineral development and the least contribution to the cumulative impacts for vegetation. However, based on the application of BMPs to site specific projects and requirements for reclamation/interim reclamation and control of noxious weeds, the contribution of cumulative impacts would be minimized or substantially reduced.

Visual Resource Management/Auditory Management (Soundscapes)

The CIAA used to analyze cumulative impacts on visual resources and soundscapes includes the entire Planning Area and the viewsheds from adjacent National Parks.

Past, present, and reasonably foreseeable future actions and conditions within the CIAA that have affected and will likely continue to affect visual resources are mineral development, road and trail construction, pipelines, transmission lines, and structures. However, the Planning Area is a relatively undeveloped landscape, with very few cultural modifications. Soundscapes are adversely impacted by operations and facilities that generate noise such as construction equipment, well drilling, production equipment, and vehicle traffic.

Oil and gas and potash development present the greatest potential future impacts to visual resources and soundscapes. Mineral development involves the construction of roads, well pads, pipelines, and facilities along with well drilling, production equipment, and vehicle traffic. Mineral development can impact recreational opportunities by conflicting with recreation users and through the creation of noise and visual disruptions that affect user experiences.

All the alternatives for the MLP/FEIS include actions that would mitigate the visual impacts associated with mineral development. These actions include the designation of areas as VRM Class II for lands with high visual qualities and surrounding Arches National Park, BMPs for visual resources, and precluding surface-disturbing activities around developed recreation sites. The objectives for VRM Class II is that the mineral activity cannot attract the attention of the casual observer from key observation points. VRM Class II designations and the protection applied to developed recreation sites would also indirectly mitigate the sounds associated with mineral development. Due to these provisions, the contribution of the alternatives in the MLP/FEIS to the cumulative impacts for visual resources and soundscapes would be minimized or substantially reduced. VRI Class II areas not managed as VRM Class II may be subject to mineral development; the scenic quality of these VRI Class II areas may be reduced to a lower VRI classification.

For all the alternatives in the MLP/FEIS, the projected mineral development would contribute to the cumulative impacts to visual resources and soundscapes. The greater the amount of projected mineral development the greater the potential contribution to the cumulative impacts on visual resources. Therefore, Alternative A would involve the greatest amount of projected mineral development and the greatest contribution to the cumulative impacts on visual resources in terms of discordant cultural modifications such as drilling operations and potash processing facilities. Alternative C would involve the least amount of mineral development and the least contribution to the cumulative impact on visual resources in terms of discordant cultural modifications, such as drilling operations and potash processing facilities. For the remaining alternatives, the projected development and corresponding contribution to cumulative impacts on visual resources in descending order is Alternative D, B1, and B2.

Wildlife and Fisheries

The CIAA used to analyze cumulative impacts on wildlife and fisheries habitat includes the lands and waters within the Planning Area.

Past and present actions that have affected and will likely continue to affect the cumulative impacts for wildlife and fisheries include mineral development and associated infrastructure, road construction, cross-country OHV use, recreation, fences, vegetation treatments, introduction and spread of non-native/invasive plant species, geophysical exploration, grazing from livestock, drought, and prescribed and wildland fire. These activities could result in short-term and long-term habitat fragmentation and animal displacement. Habitats could become unavailable to wildlife because of human disturbance factors (e.g., traffic, noise, livestock grazing activities) during sensitive time periods such as winter, birthing, nesting, and early rearing of young. Loss of vegetation from development activities would degrade habitat and increase forage competition among grazing animals. These impacts would also reduce the capability to maintain current population objectives.

Oil and gas and potash development present the greatest future potential impacts to wildlife and fisheries through construction of well pads, roads, pipelines, and other facilities. Reclamation and mitigation efforts would reduce impacts on wildlife habitat and fisheries; however, construction and maintenance of roads and well pads and the presence of humans would result in long-term or permanent impacts. The impacts would likely be greater where mineral development is more intense, in areas where development overlaps with crucial and winter wildlife ranges, and on State and private lands because of the lack of protections afforded to natural resources in these areas. As development expands, the ability of big game species to disperse into habitats outside of the Planning Area may become limited. This may create isolated populations in areas where habitats remain intact. The degree of impact would depend on the timing of development activities and whether the amount of activity outpaces the successful reclamation and revegetation efforts in disturbed areas. As development occurs (whether Federal mineral, commercial, or private residence), more pressure would be put on habitats outside of the development (likely private lands), as wildlife is displaced from the disturbances.

Under all the alternatives for the MLP/FEIS, the projected mineral development would result in surface-disturbing activities that would contribute to the cumulative impacts for wildlife and fisheries. However, all the alternatives have specific actions that would mitigate impacts to wildlife and fisheries that include TL, CSU, and NSO stipulations and BMPs for wildlife. Due to these actions the potential impacts to wildlife and fisheries are minimized or substantially reduced. In general, the greater the amount of projected mineral development the greater the potential contribution to the cumulative impacts. Therefore, Alternative A would involve the greatest amount of projected mineral development and Alternative C would involve the least amount. For the remaining alternatives, the projected development in descending order is Alternative D, B1, and B2.

4.22 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

NEPA §102(2)C requires a discussion of any irreversible or irretrievable commitments of resources that would be involved in the proposal should it be implemented. An irretrievable commitment of a resource is one in which the resource or its use is lost for a period of time (e.g., removal of vegetation). An irreversible commitment of a resource is one that cannot be reversed (e.g., the extinction of a species or disturbance to protected cultural resources).

Implementation of the MLP/FEIS would allow for surface-disturbing activities associated with mineral development that would result in irreversible or irretrievable commitments of resources. These surface-disturbing activities would potentially result in long-term or permanent alterations to soil, removal of vegetation cover, fragmentation of wildlife habitat, and damage to cultural and paleontological resources. Wildlife dependent on the affected habitats may be displaced and populations may be reduced as the carrying capacity of the range is reduced. Increases in sediment, salinity, and nonpoint source pollution that result from these activities could result in degradation of water quality and an irretrievable loss of water utility, aquatic habitats, and aquatic-dependent species. In addition, potash development would result in the industrial use of large quantities of water. However, management prescriptions actions and mitigation prescribed specified under the alternatives that are designed to protect sensitive resources would reduce the magnitude of these impacts by limiting surface-disturbing and disruptive activities. Alternative C would have the greatest reduction of impacts. Although reclamation of some disturbed sites would occur under all alternatives, the level of resource quality that existed prior to disturbance may not be achieved for several decades. Surface-disturbing activities could result in permanent impairment of wildlife habitat, water quality, and vegetation communities in some areas.

An irretrievable commitment of nonrenewable mineral resources (i.e., oil/gas and potash) would occur from the development of wells and subsequent extraction of leasable minerals oil and gas and potash over the next 15 years. The estimated number of additional oil and gas well pads that would be developed within the Planning Area under the Alternative A is 128. The estimated projected amount of annual potash production within the Planning Area under Alternative A is 2,400,000 tons. Future oil and gas and potash development under the other alternatives will depend on the implementation of a phased leasing strategy is reduced due to the limits on development imposed.

4.23 UNAVOIDABLE ADVERSE IMPACTS

NEPA §102(2)C requires disclosure of any adverse environmental effects that cannot be avoided should the Moab MLP be implemented. Unavoidable adverse impacts are those that remain following the implementation of mitigation measures or impacts for which there are no mitigation measures. Some unavoidable adverse impacts would occur as a result of implementing the Moab MLP.

Continuing to allow surface-disturbing activities would result in unavoidable adverse impacts. Although these impacts would be mitigated to the extent possible, unavoidable damage is inevitable. Permanent conversion of vegetation resources to other uses, such as mineral development, would reduce the quantity and quality of vegetation resources. Mineral development activities on public lands would create long-term visual intrusions, soil erosion and compaction, habitat degradation and fragmentation, and water quality impairment.

Development of mineral resources would cause air quality related impacts. Under all alternatives, the production and release into the atmosphere of emissions associated with mineral development would increase.

Because large portions of wildlife habitats coincide with areas available for mineral leasing, impacts on wildlife habitat would be unavoidable. Although oil and gas well sites and their associated infrastructure would be mitigated to the extent possible, long-term and possibly permanent habitat degradation and displacement of wildlife populations would be unavoidable. In addition, competition is anticipated for forage resources among wildlife and livestock. The extent of these impacts would vary by location of development activities, season, and drought cycle.

Inadvertent damage and/or destruction of cultural and paleontological resources from increased surface-disturbing activities would be unavoidable. Although mitigation measures would include identification and mitigation of resources prior to surface-disturbing activities, some unanticipated discoveries of unknown cultural and paleontological resources could potentially occur.

The land use restrictions imposed throughout the Planning Area to protect sensitive resources would impact the ability of operators, individuals, and groups to use the public lands without limitations and result in forgone opportunities to use resources within the Planning Area. Although attempts would be made to minimize these impacts by limiting the level of protection necessary to accomplish management objectives, unavoidable adverse impacts would occur.

4.24 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

NEPA §102(C) requires discussion of the relationship between local, short-term uses of the human environment and the maintenance and enhancement of long-term productivity of resources.

Any use of the resources within the Planning Area is likely to adversely impact long-term productivity of natural resources. The short-term use of mineral resources would result in surface-disturbing and/or disruptive activities that remove vegetation, increase soil erosion and compaction, create visual intrusions and landscape alterations, increase noise, impair water quality, and degrade and fragment wildlife habitat. Although management actions, BMPs, surface use restrictions, and lease stipulations are intended to minimize the effect of short-term uses, some impact on long-term productivity of resources would occur regardless of the management approach.